A TREATISE

OF

THE MATERIA MEDICA.

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PROFESSOR CULLEN'S TREATISE OF THE MATERIA MEDICA.

WITH LARGE ADDITIONS,

INCLUDING

MANY NEW ARTICLES,

WHOLLY OMITTED IN THE ORIGINAL WORK.

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IN TWO VOLUMES.

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THE AUTHOR'S PREFACE.

THE Lectures on the Materia Medica, formerly published in my name, though very incorrect, were so well received by the public, that notwithstanding my endeavours to prevent it, they have been several times reprinted, and even translated into foreign languages.

This mark of public favour led me to think of giving a more correct and complete edition of those Lectures; but finding that it was not possible for me to give it, with the corrections and supplements which would be necessary, in a satisfying manner, I have long abandoned that idea, and judged it more proper to give an almost entirely new work; which I endeavour to do in the present publication.

In this work I must acknowledge the omission of many articles which have commonly found a place in treatises on the same subject. For such omissions it is proper for me here to account.

The various nomenclature of the several substances treated of I did not think it necessary to detail, as it may be readily obtained elsewhere; and particularly I have not attempted to ascertain the nomenclature of the ancients; both because of the difficulty that attends such a labour, and because the utility of it to me appears very doubtful. In this last respect, if any one shall differ from me, he may find enough of it in other writers; none

of whom however, have ascertained the matter so clearly as to prevent the many ill-founded and useless transcripts and quotations from the ancients which still too frequently appear.

In ascertaining the species of plants where several of the same genus may be employed, I have purposely omitted entering into any critical discussion which of them is the most proper for the purpose of medicine. This is often a necessary labour; but I thought it enough for me, in the Catalogue which I have prefixed to my Treatise, to mark the botanical distinction of the species I judged most fit to be employed, and of which only I intended to treat in the after parts of my work.

A third, and perhaps more considerable, omission which I have to account for is, the not giving any description of the medicine as it is employed, or fit to be employed. This, however, I have omitted, because I could not do it so completely and accurately as the authors to whom I shall refer, and whom I suppose my readers to have in their hands.

That I have not given the chemical analysis of the several substances, is an omission which, if I mistake not, will require no apology in the present age. I have omitted it, because I judge it to be of no use in explaining or ascertaining the virtues of medicines. Any person who is of a different opinion may find such analysis in the accounts of the Academy of Sciences, as they are fully and faithfully given in Mr Geoffroy's Treatise on the Materia Medica.

Though I may be readily excused for omitting the chemical analysis, I doubt whether I shall be so easily forgiven for frequently omitting the treatment of substances by the application of different menstruums, and for not mentioning the quantities of extract that are obtained from each of them. An attention to this is very

necessary in the pharmaceutic treatment of medicines, and I have frequently pointed out the application of it; but I did not think it proper to increase the bulk of my work by details contained in books to which I refer, and which I wish to recommend to all my readers.

From the omissions above mentioned, and from others that may be observed, it will be readily perceived that the following work is not offered to the public as complete and sufficient for every class of students. I do not indeed suppose that it can be understood by persons who have no previous knowledge of the Materia Medica, or who have never read other books on the subject. On the contrary, I wish that other books may have been read; though, from what I have said in my history of the several writers, it will appear that very few of them are to be read with advantage or even with safety, and I find it difficult to point out a selection.

There are however three works which I can venture to recommend, and which I wish to place in the hands of all my readers. These are the treatise of the Materia Medica by Dr Lewis, as now published by Dr Aikin; the Treatise of Petrus Jonas Bergius on the Materia Medica, taken from vegetables; and the Apparatus Medicaminum, by the learned professor of Gottingen, Jo. Andreas Murray, knight of the royal order of Wasa.

In these three books a student will find the omissions I have mentioned above fully and correctly supplied. I wish him also to consult them for another purpose, as he will there find the grounds and occasions of many of the reflections which I have offered in the course of this present Treatise.

Having thus taken notice of the omissions in this publication, and the means by which many of them may be supplied, I am now to mention in general what my Trea-

tise contains, and what apologies may be necessary for its various imperfections.

I have not attempted to give a full account of all that might be said of the several subjects of the Materia Medica. My chief purpose is to give the principles upon which those substances are to be judged of as medicines; to correct the errors of former writers in that respect; and to offer some new principles and doctrines which to me appear to be necessary. These doctrines are given partly in my general introduction to the whole, and partly in the reflections on the general operation of medicines, which I have prefixed to the several chapters. These discussions have extended that introduction, as well as some other parts of my work, to a length beyond what might have been expected; but the state both of physiology and pathology, for ages past, over the greatest part of Europe, led me to think such discussions necessary. These speculations may often appear doubtful, especially to persons little exercised on this subject. I hope however they are well founded; and I offer them with entire deference to the judgment of the public.

In assigning the virtues of medicines, I have avoided the compilations which have been so often injudiciously made, by repeating almost every thing that had been said before on the subject, and commonly without any proper distinction of authorities or of probabilities. In this business I have avoided the fault which Galen imputed to Dioscorides, and which has been the fault of almost every writer on the Materia Medica since his time, that is, of ascribing too many virtues to one and the same medicine.

I have, on the contrary, been sparing in assigning virtues; and I have assigned those only which are founded upon a nice selection of authorities; such as seem to me to be consistent with the laws of the animal œconomy:

and especially such as I have had confirmed by the experience which an extensive practice of fifty years has afforded me an opportunity of acquiring.

It may be alleged that I seem to be very sceptical with respect to the assertions of writers on the Materia Medica; and it may be true that I have been perhaps too rigorous in that respect: but I am persuaded that every practitioner of judgment and extensive experience must to a very great degree become sceptical upon the same subject. As my doubts, however, have arisen chiefly from my own experience, I must in candour admit, that my experience, like that of every one else, may be fallacious, especially in concluding from negative experiments. In all cases, therefore, where medicines show active parts, I advise farther trials to be made, as I may not have employed large enough doses, nor have adapted them properly to the circumstances of disease.

It may be further observed, that through the whole of this work I have omitted a number of articles entirely, and have been brief upon many others to be commonly found in books, while on some others I may seem to be rather diffuse. This I acknowledge to be true; but I flatter myself that the articles omitted, or passed over slightly, will be found by most judges to be such as do not deserve more particular notice. I should indeed have omitted more than I have done, had it not been that I judged it necessary to correct the assertions frequently to be found in the writers on this subject.

With respect to the articles on which I may perhaps be accused of prolixity, they will be found to be upon subjects the most important, and the most frequently employed in practice; such as *Milk, Peruvian Bark, Opium, Camphire, Mercury,* and several others. In considering such subjects, I wished to ascertain, with some precision,

their use in the great diversity of diseases, and circumstances of disease, in which they have been employed.

Throughout the whole of my work, to support my reasonings, and to authenticate the facts adduced, I have quoted the testimony of writers whom I myself, and I believe the public, esteem; but it may be complained of, that in doing this, I have not always specified the particular works, or the parts of the works, of the authors I refer to. This indeed is a defect; but the supplying it would have required more time and pains than I could have easily bestowed, and I hope it is of little consequence, as my references are chiefly to well known books, in themselves provided with indexes. If, however, my references to authors only are sometimes too general, the parts of their works necessary to be consulted will commonly be found in one or other of the three books I have mentioned above, as in them similar references are commonly made, and at the same time the parts of their works more particularly pointed out.

In the composition and language of this work there are many faults and imperfections; but the occupations of teaching and practice have not allowed me the time that was necessary to have them properly corrected; and if the performance has otherwise any merit, I hope these imperfections will be excused, and especially when it is considered that the finishing of this work was necessarily delayed till a very advanced period of life, the 77th year of my age.

To the whole of my work I have subjoined a copious index, which I hope will be found useful, particularly in this, that with respect to every article of the Materia Medica, which may not be completely treated of in one place, or in the one expected from the contents, what further relates to it in other places may be found by

means of the other numbers in the index; and for a complete knowledge of any subject, it will always be proper for my readers to take notice of all the several parts in which they are mentioned.

In this index I have inserted not only the subjects of the Materia Medica, but also the names of all the writers I have referred to; from which the history of these authors, their merits and defects, and in several respects the progress of this part of science, may be learned; circumstances which may not only gratify the curiosity of many students, but may afford them, I hope, some useful instruction.

EDINBURGH,
March 1789.

THE EDITOR'S PREFACE.

THE public is now presented with the fourth American edition of Professor Cullen's *Treatise of the Materia Medica.*

The three former editions of this work were merely republications, and not always sufficiently correct, of the original work, *without any additions.* The present edition will be found to contain *many* additions, and some of them, I flatter myself, not wholly unimportant. They will, at least, render the work more useful to the student of medicine, and especially to those gentlemen, from every part of the American Union, who annually honour my public lectures on the MATERIA MEDICA with their attendance.

The notes and other additions to the first volume are much more considerable than I had originally contemplated. They are, indeed, pretty numerous. Some of them will, I hope be found neither trivial nor unimportant to the practitioner of physic, who can never devote too much attention to the study of the real nature and effects of aliments, and especially of individual articles, both for preserving health and for curing diseases. Dr CULLEN'S treatise of aliments is, unquestionably, a very important portion of his work, which should be perused, and reperused, with care, by every physician: and which may

even form an useful addition to the library or the *table* of those whose health is delicate and infirm; and of those whom, by a monstrous violation and perversion of the original word, we denominate EPICURES.

I regret that my time would not permit me to enlarge still further the treatise on Aliments, and, in particular, to extend my own views of many articles of diet, which are daily consumed at our tables, not a few of which are, in a great measure, confined to the tables of the people of America. Perhaps, I may live to accomplish a work of greater extent, both on this subject and on the subject of medicines properly so called: meanwhile, it will afford me much real satisfaction to learn, from competent and from candid judges, that the additions which I have made to the first as well as to the second volume of the Materia Medica of my ILLUSTRIOUS PRECEPTOR, are not deemed unimportant.

It may be necessary to say more specifically, what are the additions which have been made to the original *Treatise* of Professor Cullen.

Besides a considerable number of notes at the bottom of the page, and additions, in the body of the text or page, to the articles which Dr CULLEN has treated of, the following is a list of the principal new articles, entirely unnoticed by the author, which I have introduced into the first volume.

Different species of Vaccinium, or Whortle-Berry,
Diospyros Virginiana, or Persimmon,
Cucurbita Citrullus, or Water-Melon,
Phytolacca Decandra, or Poke,
Different species of Asclepias, or Milk-Weed,
Convallaria Polygonatum, or Solomon's-Seal,
Zizania, called Wild-Rice and Wild-Oats, of different species,

Convolvulus Batatas, or Sweet-Potatoe,
Arrow-Root, and Tapiocca,
Tuber Tucca, or Tuckahoe,
Arachis Hypogæa, or Ground-Nut,
Different species of Juglans, or Walnut and Hickory,
Helianthus Annuus, or Great Sun-Flower.

A reference to the *Catalogus rerum specialium*, &c., will immediately show what additions have been made to that part of the first volume, which treats of *Animal Aliments*.

All the following articles, which are more or less fully treated of in the second volume, are either wholly unnoticed, or at least barely mentioned, by the author of the work.

Argentum,
Bismuthum,
Arsenicum,
Stannum,
Angustura,
Chironia angularis,
Frasera officinalis,
Zanthoriza apiifolia,
Helleborus trifolius,
Liriodendron Tulipifera,
Magnolia tripetala,
————glauca,
————acuminata,
Cornus florida,
Helenium autumnale,
Podophyllum Peltatum,
Spiræa trifoliata,
Lyttæ,
Spigelia,
Melia,
Helleborus fœtidus,
Chenopodium anthelminticum,
Dolichos Pruriens,
Pyrola,
Pareira Brava.

In regard to the articles which occur in the original work, many of them I have left exactly as I found them, without making *any* additions whatever to them. But additions to many other articles have been made. The following is a list of the principal of these articles: viz.

Plumbum, Hydragyrus, Uva Ursi, Opium, Seneka, Stramonium, Digitalis, and the class of Menagoga.

All the notes at the bottom of the pages, except the very few which are marked with the letter C, are the Editor's additions. His additions in the body of the page are sufficiently distinguished from the original text of the Author, by being marked with a star and by brackets, as in the articles *Opium, Hydragyrus,* the class of *Menagogues,* &c. In one or two instances, as in the article *Plumbum,* or *Lead,* the star within the bracket [*] has been accidentally omitted by the printer.

The whole of the two classes of ANTHELMINTICS and ANTILITHICS, are additions to the original work.

In justice to Dr CULLEN, if not to myself, I have thought it proper to be thus particular in informing my readers, what additions have been made to the original Treatise, and how they are to be distinguished from those of the learned Author.

Although, however, much has really been added to the work, I am fully sensible that much more might have been added, to the profit of the student. I ought, perhaps, to have said something concerning the medical properties of muriate of the GOLD, which has begun to excite much attention among physicians. But on this subject, I could say nothing from my own experience. And, perhaps, I have not been a careless observer of the progress and fate of the chemical medicines, which, within the last twenty years, have been so confidently, and so loudly, praised as important acquisitions to medicine. With infinitely more of science, there is not much less of extravagant enthusiasm among many of the chemical practitioners of the present day, and especially those on the continent of Europe, than there was among the intrepid practitioners who form the CHEMICAL ERA of medicine, in

the sixteenth century. I would not, by this observation, be understood to subscribe to the opinion of certain writers,—an opinion rather leaned to, perhaps, by Dr Cullen,—that the improvements in modern chemistry, have not essentially benefitted the materia medica, and consequently the practice of physic. I am of a very different opinion; and I confess, that I look forward, with great and pleasing confidence, to the time, which, considering the activity of our age, cannot be remote, when we shall receive from the chemists, not a few important remedies for some of those diseases which are now deemed incurable, or which are at least very imperfectly under the dominion of medicine.*

I believe that the chemical opinions of Dr Cullen were, in general, deemed tolerably correct, at the time they were published; and they may have passed as such for some time after. But chemistry, since the death of this celebrated man, has undergone a revolution: a revolution more complete than that which has marked the history and progress of any other science, within the same period of time.

It is easy to perceive, therefore, that our author's chemistry must stand in need of much and essential correction. It was my original intention to have introduced these corrections into the present edition of the Treatise. But I soon found, that the task would have involved me in much difficulty. And so rapid is the progress of this all-changing science, that it required no peculiarly nice discernment to discover, that what was

* The reader may consult, with advantage, the writings of Mr Chrestien, Mr Duportal, Mr Pelletier, and others, on the use of the oxydes, muriates, and other preparations of gold, in siphilis, cancer, and other diseases.

corrected this year, might not be deemed *correct* the following year.

I relinquished the idea of correcting the chemical errors of the Edinburgh professor, except in a very few instances indeed. But, so far as this work shall be read by those who attend my lectures on materia medica in this University, they shall have no reason to complain, on this score; as I never omit noticing the chemical history and composition of every substance of which I treat, to which the attention of the modern chemists has been particularly directed. Besides, it is expected, that every reader of this *Treatise* will read, as a student or practitioner of medicine, at least one approved elementary work on chemistry.

The physiological opinions of Dr Cullen have been left much in the state in which I found them. Yet not a few of these might have been corrected. I was the less disposed to enter upon the difficult task of essentially changing the professor's views, in this part of his subject, as much of what he has said is not necessarily connected with a treatise, or with a course of lectures, on the materia medica; and because I was unwilling to interfere with the chair, to which more especially the physiological part of medicine is committed. An outline of my own views in physiology, so far as they are interwoven with the science of materia medica, and with that of natural history and botany, I hope to publish early in the course of the ensuing winter, in an extensive *Syllabus* of my lectures, on these three branches of science.

In speaking of those articles of medicine which are peculiar to America, I have, in general, been very brief, because I have elsewhere treated of the whole, or greater number of these articles, in my *Collections for an Essay towards a Materia Medica of the United-States*, two

parts of which have already been published. Materials for a third part, which will perhaps close the work, are in my possession, and will, I hope, be given to the public early in the month of November next.

BENJAMIN SMITH BARTON.

PHILADELPHIA,
December 23, 1812.

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VOLUME I.

THE HISTORY

OF THE

MATERIA MEDICA,

WITH SOME ACCOUNT

OF

THE CHIEF WRITERS UPON IT.

IT is sufficiently probable, that very soon after the first beginnings of human society, some art of physic and some knowledge of remedies arose among men: and accordingly, no country has been discovered, among the people of which, however rude and uncultivated in other respects, an art of physic and the knowledge of a great number of remedies has not been found. The invention of remedies amongst the rudest people may in a great measure be accounted for, from the instincts arising in certain diseases; from the observation of spontaneous cures effected by the powers of the animal œconomy; from accidental errors in the choice of aliments; and even from those random trials, to which pain and uneasiness often lead. But it is not necessary to insist on such speculations at present; and it is still less requisite to repeat here, the many frivolous and fabulous accounts that have been given of the invention of particular remedies and medicines.

In whatever manner these may have been first invented, every account we have of the progress of arts amongst men informs us, that the art of physic and the knowledge of remedies have had a share in that progress; and that at all times the urgency of disease, and the knowledge of a few remedies, have engaged men in a constant endeavour to increase the number of them.

In what manner this proceeded in different countries in ancient times is not exactly known. The most ancient account we have of arts is that of their being cultivated in Egypt, but we know few

particulars of the state of them there that deserve to be taken notice of; and with respect to medicine in general, it is needless to inquire, as it is known to have been under such regulations as must have been a certain obstacle to its progress and improvement.

The first distinct accounts of the art of physic, as exercised by a particular class of men, are those we have of it in Greece among the priests of ESCULAPIUS. It would seem, that for some time these priests, if not the sole, were at least the chief, practitioners of physic in that country; and as the trade was lucrative, it is to be presumed, that these practitioners would endeavour to become knowing in it, and consequently to extend and enlarge their knowlege of remedies. In the temples of Esculapius, therefore, it is probable that a stock of knowledge was preserved, and transmitted down from one set of priests to their successors; and at the same time, these temples afforded a particular means of preserving the knowledge of the materia medica; for we know it to have been then common for persons who had been cured of diseases, by the remedies prescribed to them in the temple, to hang up there votive tablets, on which were written some account of their disease, and of the remedies by which it had been relieved.

It is not my business here to trace the progress of physic in Greece; but we may in general observe, that it had its first beginnings in the temples of Esculapius; that these were the first schools of the art; that the first writings upon it were produced there; and that the first clinical practitioners were sent out from these temples. The celebrated HIPPOCRATES was one of these; who, after having been instructed in all the knowledge of the school of Cos, and probably also well accquainted with that of Cnidus, became an itinerant and clinical practitioner.

Very few accounts remain of the medicines employed in the temples of Esculapius; and it will readily occur, that the first correct information must be expected and sought for in the most ancient medical writings now remaining, and which are those commonly ascribed to Hippocrates. These writings, however, at least for the purposes of history, afford a precarious and uncertain information; for, as we now have them collected together, they are certainly the works of many different persons, as well as of many different ages; insomuch, that it is impossible, with any clearness, to judge what was the true state of the materia medica in the time of Hippocrates. Besides, if we reflect in how many instances the nomenclature is entirely unknown, and in how many it is very doubtful and uncertain, we shall be satisfied how idle it is in modern

writers to quote the authority of Hippocrates for the virtues of almost any medicine. Indeed laying aside our partiality for that celebrated person, there can be no just ground for supposing, that at the period in which he lived, much discernment in the materia medica could have prevailed; and it is hardly necessary to add, that even although the substances named in those writings were known to us with more certainty than they are, yet the distinction of diseases and of their circumstances are so seldom given, that at present we can hardly be guided by them in employing any of the medicines they suggest.

Soon after the age of Hippocrates, Aristotle and Theophrastus, by laying the foundation of natural history, paved the way for a great improvement in the knowledge of the materia medica: but in ancient times that improvement was never carried far; and consequently, for want of the means of accurately distinguishing substances from one another, this branch of physic remained in much uncertainty and confusion.

For a long time after the age of Hippocrates, we have hardly any of the writitings of the eminent physicians of Greece, at least any of known date, from whence we might learn the progress of the materia medica amongst them. We may presume, however, that they were constantly endeavouring to find out more efficacious medicines; and therefore, upon the whole, increasing their number. At the same time, this seems not to have been the case with Erasistratus; who is said to have employed few medicines, and those only of the milder kind; and to have declared against the compound medicines, which even in those days were studiously attempted.

Although Erasistratus, by this conduct, might in some measure retard, yet there were others who at the same time favoured, the progress of the materia medica, and particularly the equally celebrated anatomist Herophilus, who was nearly his cotemporary. This person, who held a distinguished rank amongst the physicians of Greece, was very much employed in quest of remedies; and probably gave so much encouragement to this study, as to make his disciple Philinus of Cos devote himself entirely to empiricism. Philinus is by many supposed to have been the author or founder of the sect of professed empirics which appeared immediately after that time: But whether we suppose Philinus, or with more probability Serapion of Alexandria, to have been the author of that sect, certain it is that it arose immediately after the time of Herophilus; and this period might be considered as one of the most remarkable in the history of physic in general, or of the materia medica in par-

ticular. It produced, however, no considerable revolution in either the one or the other.

What the empirics contributed to the reformation or improvement of physic is not now known. HERACLIDES of Tarentum was of the empiric sect, and is said to have been a person of judgment and diligence in the study of the materia medica; but neither his writings, nor those of any other of the same sect, now remain, nor are there any clear accounts of their improvements now to be found. This seems to afford a pretty certain proof that their labours were very fruitless: For had they discovered any new remedies, or ascertained more exactly the virtues and proper administration of those already known, it may be safely presumed, that such improvements would have been adopted and preserved by the practitioners of every other sect.

The scheme of the empirics was sufficiently specious, but the accomplishment of it was only to be attained in the course of many ages: and therefore, while men constantly found it incomplete and imperfect, as it is even at the present day, practitioners were ever ready to desert it, and to seek for those aids which were promised by the other plans of physic. These remarks on the ancient empirics, may perhaps enable us to account for the very imperfect state of the materia medica, not only among the ancients, but also at all times since, in so far as it depends upon experience alone.

Although such had been the slow progress of the materia medica among the physicians of Greece, it might be expected to have received some improvement when physic came to be established at Rome. This, however, if it took place at all, was to be ascribed to the Greek physicians who came and practised there; for amongst the Romans themselves the arts had remained long in a very rude and imperfect state. Of this we have a strong evidence in the works of CATO the censor, which yet remain: for in these we have an incantation given for the reduction of a luxation; and the brassica seems to have been with Cato an almost universal remedy. This may serve to show, that we are not to inquire after the materia medica among the Romans themselves, but amongst the Greek physicians who practised at Rome.

The first of these who became of eminence was ASCLEPIADES. He had not been originally devoted to the profession of physic, and in entering upon it seems to have formed a system for himself: but if he followed any of the great physicians of Greece, it was Erasistratus; who established a mild practice, employed few medicines, and declared strongly against the luxuriancy of composition

which was then attempted. Like him, Asclepiades seems to have employed a small number of medicines only, and therefore contributed little to the study of the materia medica.

Although he acquired great authority amongst the practitioners of Rome, yet there were probably few of these who could enter into the subtleties of his theory; and it was this difficulty which gave occasion soon after to the establishment of the sect called *Methodic*. The plan, however, of this sect confining them to three general indications only, was by no means suited to enlarge the materia medica; which accordingly does not seem to have been an object of their cultivation.

Upon this occasion, it is proper to take notice of the elegant Celsus, who lived at this period, and was the only native of Rome who ever became distinguished in the line of physic. Though perhaps not strictly of the profession, he was undoubtedly often engaged in the practice; and in his writings we have many proofs of his discernment and good judgment. In his works, we find a great deal more relating to the materia medica than in those of any former author; many medicines being enumerated by him, and a judgment given with respect to them. Unfortunately, however, we are under such uncertainty with regard to his nomenclature, that we cannot always be determined in our judgment respecting the propriety of his doctrines. He is particularly full in his account of alimentary substances: so that it is with respect to these we can best judge of his opinions; and it is there we find some singularities which we can hardly approve of. In modern times, much mischief has been imputed, perhaps not very justly, to the *farinacea non fermentata*; and few moderns therefore will approve of Celsus, in preferring the *panis sine fermento* to the *panis fermentatus*.

In many instances, his judgment, if we understood it well, might be found perhaps to be very good; but in other particulars, we cannot readily admit of it. Thus, in Book II. Chap. XVIII. where he is considering the quantity of nourishment in different aliments, he has the following assertions, which certainly do not discover any correct principles on the subject.

Omnia legumina, quæque ex frumentis panificia sunt, generis valentissimi esse.

In media materia——ex quadrupedibus leporem: aves omnes a minimis ad phœnicopterum.

Imbecillimam materiam esse——oleas, cochleas itemque, conchylia.

Ex avibus——valentior, quæ pedibus, quam quæ volatu magis nititur.

Atque eæ aves quoque quæ in aqua degunt leviorem cibum præstant, quam quæ natandi scientiam non habent.

Inter domesticos quadrupedes, levissima suilla est.

Omne etiam ferum animal domestico levius est.

These opinions, and several of a like kind, will hardly at present be admitted as just.

With respect to Celsus, it is proper to mention, that before his time there had commenced a particular object of study which very much engaged him, and all the after-writers on the materia medica among the ancients. This was the study of poisons and of their antidotes. What the experience of Mithridates in this matter might amount to, I cannot positively determine; but a great deal of what the ancients have said on the subject of poisons, seems to have been purely imaginary. Indeed there can be no doubt that their doctrine of antidotes was frivolous and ill-founded; whilst, at the same time, the luxuriancy of their composition shows that they hardly had any discernment with respect to the particulars of the materia medica. Even Celsus himself is not to be exempted from this criticism.

This direction in the study of the materia medica, with respect to poisons and antidotes, I should perhaps have mentioned before, by taking notice of a writer who lived long before Celsus, and some of whose writings still remain. This is Nicander of Colophon, whose poetical works, *Theriaca* and *De Alexipharmacis*, have been frequently published and commented upon, though it does not appear that they merited any such attention. His skill in natural history appears to have been very mean and incorrect, and has much fable intermixed with it. His antidotes, in so far as we know them, or can judge of them from later experience, are very ill founded; and this, with their being crowded together into one composition, gives much reason to suspect that Nicander's knowledge of the several particulars of the materia medica was extremely imperfect.

After Celsus, the next writer on the subject of the materia medica, to be taken notice of, is Scribonius Largus, who treats professedly of the composition of medicines. With regard to him, we must give precisely the same judgment as with respect to Celsus. There occur in him the same uncertain and doubtful nomenclature; the same abundance of external remedies; and, respecting the internal, the same inaccuracy in distinguishing diseases, as well as the like

imperfection in marking the causes and circumstances of those to which medicines should be adapted. Together with all this, we find the same study of poisons and antidotes, and the same injudicious luxuriancy of composition, which has disgraced the prescriptions of physicians ever since.

From this writer we perceive, that the same ungenerous selfishness of keeping medicines secret prevailed in ancient times, as it has often done since, to the reproach of the profession: and from the history of ANTONIUS PACHIUS we find, that then, as since, these secret medicines were in a quackish manner held forth as almost universal remedies.

In Scribonius there occur also many superstitious follies with respect to remedies, which detract very much from the good sense and philosophy of those days; and such indeed occur not only in him, but in Pliny, Galen, and all the other writers of ancient times.

The luxuriancy of composition would seem to have been at its height about this time in the hands of ANDROMACHUS senior; and it affords a certain proof of the very slow progress of discernment in the business of the materia medica, that even to the present day the compositions of Andromachus have retained a place in our Dispensatories. Even the London College, who, in their Dispensatory of the year 1746, had shown so much discernment and judgment in correcting the luxuriancy of composition, still retained the Theriaca Andromachi in its ancient form; which, though perhaps contrary to the judgment of some of the members, yet discovered how much many of them were still governed merely by the power of habit.

After mentioning the time of Andromachus, we are arrived at a remarkable period in the history of the materia medica, which is that of the time of the much esteemed DIOSCORIDES. This author, who probably lived in the time of the emperor Vespasian, is, of those now remaining who wrote professedly on the subject, the most ancient. He is commended by Galen as one of the best and most complete writers on the materia medica; and he is remarkable for having been considered ever since as the principal and classic writer upon it. He has accordingly been transcribed and repeated by almost every writer since; but that this has been owing to the real value of his writings, it is not easy to perceive.

DIOSCORIDES has given us a large list of medicines, with some opinion respecting each; but as his descriptions are very imperfect, and the nomenclature has been since very much changed, we are often uncertain what the substances are which he treats of, and therefore cannot always judge how far the virtues ascribed to them

are well founded. In several respects, however, his judgment in general may be suspected. When we find him so often ascribing to substances the power of resisting the poison of serpents and other animals, and even of curing the bite of mad dogs; when he gives us many medicines for dissolving the stone in the bladder, for consuming the spleen; for moderating the venereal appetite in males, and for preventing conception in females; for promoting the birth of children, and expelling the secundines and dead fœtus, and for making children black-eyed; the ascribing these, and other improbable virtues, gives me a mean opinion of the judgment of Dioscorides, or, if you will, of the physicians of his time, in this business. Linnæus, by the character of *Experta*, which in his list of writers he annexes to the writings of Dioscorides, seems to consider these writings as the fruits of experience; but I cannot believe that Dioscorides had consulted experience, when he attributed to so many medicines the power of promoting urine, and of exciting the menses. Such powers may truly exist in many medicines; but it may be truly asserted, that they are not to be found in one of a hundred to which Dioscorides has ascribed them.

In many parts of his writings, where he treats of substances which we may be supposed acquainted with, the justness of his skill in assigning virtues is very doubtful; and to me he appears to be not only mistaken, but sometimes inconsistent with what he has said in another place. In many instances he is loose and undistinguishing, with respect to the circumstances of diseases to which medicines are to be applied; and often pointing them out only as being useful in general, as in *Vitiis Renum*, *Pulmonum*, *Vulvæ*, &c.: but such opinions are generally useless, and may be often misleading and pernicious.

From these considerations, I cannot join in that superstitious regard which has been so generally paid to Dioscorides; and must deem it to have been rather unfortunate for the study of the materia medica in modern times. It has certainly been unlucky that more labour has been bestowed to ascertain the medicines pointed out by him, about which we are doubtful, than in ascertaining the virtues of those substances we are acquainted with.

Nearly at the same time with Dioscorides, or soon after, lived the elder Pliny, another copious writer on the materia medica. This truly learned man was, however, as upon most other subjects, so in particular on that of the materia medica, a mere and often an injudicious compiler. He has frequently repeated after Dioscorides, or the authors whom Dioscorides had himself borrowed from; al-

though, being hardly in any case a practitioner in physic, he was perhaps less fit than Dioscorides for making a compilation on this subject. With respect to his writings on the materia medica, we can only say, that every difficulty and every fault that occurs in the writings of Dioscorides occurs also in those of Pliny.

In justice to the latter it must, however, be acknowledged, that he discovered more judgment than his cotemporaries, in condemning the very luxuriant compositions which at that time were so much affected. After mentioning the number of ingredients in Mithridatium Antidoton, and taking notice of the small proportion of some of them, he adds, "Quo deorum perfidiam istam monstrante ? Hominum enim subtilitas tanta esse non potuit. Ostentatio artis et portentosa scientiæ venditatio manifesta est."

Soon after Pliny appeared the celebrated GALEN, from whose extensive knowledge and erudition, and especially from his large experience in the practice of physic, we might have expected a great improvement of the materia medica ; but we are much disappointed, as we find nothing in his writings sufficient to excuse the insolence with which he treats his predecessors, nor to support the vanity he discovers with regard to his own performances.

On the subject of the materia medica, he attempted what was very much a new system. He maintained, that the faculty or power of medicines depends chiefly upon their general qualities of heat and cold, moisture and dryness. He observed, that the writers before him had supposed the same ; but that their doctrines could not be usefully applied, because they had not observed the various combination of these qualities, and much less the various degrees in which the quality might be in every particular substance. All this Galen endeavoured to supply : and for that purpose he supposed that every quality might be in four different degrees, and that its powers would be in proportion to these ; and when he treats of particulars, it is chiefly to tell us what are its general qualities, and the different degrees of these in each. His judgment of these is not taken exactly from the sense of taste and odour which every subject affords, or from any other measure which could then be applied : Even the general qualities, and more so their several degrees, are hypothetically and much at random assigned. Though the whole of the doctrine were better founded, I need not say that it would not apply to the ascertaining the virtues of medicines ; and Galen himself takes notice, that certain virtues do not depend upon the general qualities, but upon somewhat not easily ascertained in the whole of the substance.

Though the doctrine in general was false and inapplicable, yet it was received and implicitly followed by all the physicians of Greece who came after Galen; and indeed by all the physicians of Asia, Africa, and Europe, for at least 1500 years after his time.

To judge further of the state of the materia medica at the time of Galen, we must observe, that in treating of particular substances, besides giving us the state of the cardinal qualities in each, he gives us sometimes particular virtues which might not seem to arise from the general qualities: but in this he is not more correct, or, if I might be allowed the expression, not more wise than Dioscorides. The resisting the poison of serpents, and even of mad dogs; the dissolving the stone in the bladder; the consuming the spleen; the expelling the secundines and dead fœtus, and some other equally improbable virtues, he ascribes to various substances. He justly finds fault with Dioscorides for attributing too many virtues to the same substance; but he is not himself every where free from the same fault. It might have been expected that he would frequently have appealed to his own experience; and sometimes, though very rarely, he does so: Although he had done it more frequently, there are passages in which we cannot admire the accuracy of his discernment.

In repeating after Dioscorides the virtues of the damasonium, he adds, "Sed nos ea quidem experti non sumus: quod autem constitutos in renibus calculos, aqua in qua decocta fuerat pota comminuat, id certe experti sumus." On the lapis Judaicus he has this remarkable instance of his experience: "Ad vesicæ lapides——— in quibus nos experti sumus, proficit nihil, quod ad lapides vesicæ pertinet; verum ad eos qui in renibus hærent, efficax est." Other examples may be given of Galen's false experience: but it will be sufficient to remark, that there can be no stronger proof of this, than when a person imputes effects to substances absolutely inert with respect to the human body; and such are the various superstitious remedies, sympathetic cures, and most of the amulets, that have been employed as remedies. Galen gives us a remarkable instance on the subject of pæony. He is probably the author of the anodyne necklace, so long famous among the great and little vulgar of England. If he had taken his opinion of the pæony from the testimony of others, or even from the theory he has here laid down in favour of its possible virtue, I should have been ready to excuse him; but when he gives it as a matter of his own particular experience, I must suspect either his truth or his discernment. Here is his account, as translated by Charterius—"Eo propter haud des-

peraverim, eam (quod merito creditum est), ex collo pueris suspensam comitialem morbum sanare. Equidem vidi puellum quandoque octo totis mensibus morbo comitiali liberum, ex quo hanc radicem gestavit; ac postea forte fortuna quum, quod a collo suspensum erat, decidisset, protinus denuo convulsione correptum; rursusque suspenso in locum illius alio, inculpate postea egisse. Porro, visum est mihi satius esse rursum id collo detrahere, certioris experientiæ gratia. Id quum fecissem, ac puer iterum esset convulsus, magna recentis radicis parte ex collo ejus suspendimus; ac deinceps prorsus sanus effectus est puer, nec postea convulsus est." He adds his explanation of this event, which I need not consider, as at any rate it will hardly apply to the fact that he gives in the same paragraph, of some threads tied about the neck of a viper so as to suffocate it, and afterwards tied about a patient's neck and curing all sorts of tumors arising in it.

Besides his Treatise of Simple Medicines, Galen has given us two others works that may throw some light on the state of the materia medica in his hands. One of these works is his Treatise de Compositione Medicamentorum secundum Locos; that is, as they are adapted to the several parts of the body. In this we have a large collection of compound medicines; and the largeness of the collection which appears in the number of compositions for the same disease, and the number of ingredients in most of the compositions, show sufficiently to me the great want of discernment in the nature of medicines. This want of discernment appears fully enough in Galen himself: for although he is not indeed without giving us his own judgment; yet certainly, from his own observation or experience, he had not arrived at any nice judgment, when the work I have mentioned is almost entirely a compilation from Andromachus, Asclepiades Pharmacion, Archigenes, and a number of other writers who had gone before him.

We have thus said enough of the materia medica of Galen, and perhaps more than it deserved: but as his system continued to be implicitly followed so long after his own time, it seemed proper to show what was, almost entirely, the state of the materia medica till the middle of the 17th century; and as there are still in late writings many remains of what was derived from Galen, I was willing to show upon how bad a foundation many of these writings have been compiled, and particularly to mark out how much a veneration for antiquity has retarded the progress of science in modern times.

After Galen, no change in the plan of the materia medica was made by the physicians of Greece; and although in Aetius, Oribasius, and some others, there are large compilations on the subject, yet they are nothing more than compilations, conspicuous for the same imperfections which are so remarkable in the writings of Galen himself.

When the knowledge of physic had very much declined among the Greeks, it happened to be transferred to the Saracens, whom we commonly speak of under the name of Arabians; and these for some time were almost the only persons in Asia and Africa who cultivated science. Amongst them, in a climate which had not been before examined, several of its productions, learned perhaps from the natural physic of the people, were added to the materia medica of the Greeks, and probably with some improvement; as in place of the more violent and drastic purgatives of the Greeks, the Arabians substituted several of a milder kind. In no instance, however, that I can perceive, did they discover any medicines of peculiar power; and as they had derived almost the whole of their knowledge of physic from Greece, so in every part of it they had adopted very entirely the system of Galen. In particular, it does not appear that they made any improvements, either in the general plan of the materia medica, or in ascertaining the virtues of particular medicines.

In one instance, however, they laid the foundation of a very considerable change, which afterwards more fully took place in our subject; for it was certainly amongst them, that, for the purpose of medicine, substances where first operated upon, and were prepared by the peculiar operations of chemistry.

In the same state that physic was amongst the Arabians, it was, after a long age of ignorance, revived in the western parts of Europe, by schools that were established there by the Arabians or their disciples. It was revived, however, among men not only in the lowest condition with respect to science, but of no industry or activity in the pursuits of it; and from whom, therefore, nothing new was to be expected. Accordingly, nothing new appeared among the physicians of Europe, while they continued to be the servile followers of the Arabians.

At length, about the middle of the 15th century, the taking of Constantinople by the Turks having forced many learned Greeks to take refuge in Italy, this event, together with some other circumstances, gave rise to the study of the language, and thereby to the literature of the Greeks in the western parts of Europe.

The physicians becoming thus acquainted with the writings of the ancient Greeks, soon perceived that these were the chief sources from whence the Arabians had drawn their knowledge, and very properly applied themselves to the study of the original writers. From thence having observed that in some particulars the Arabians had deviated from the practice of the Greeks, they set themselves to criticise the Arabians, and to correct the errors derived from them, which then prevailed. This produced some controversies between those who followed the Greeks and those who still tenaciously adhered to their Arabian masters; and these controversies continued for some part of the 16th century. By degrees, however, the Greek party prevailed, and the Arabians came to be generally neglected; though it is curious to be observed, that so late as the middle of the 17th century, Rolfinck, a professor of Jena, read lectures upon the Arabian Rhazes, and Plempius of Leyden published and commented upon a work of Avicenna.

Upon this occasion, I could not avoid touching this part of the history of physic, though it has little relation to our subject; which, during the period mentioned, made very little progress among persons who were almost entirely the bigotted followers of the ancients. Whether they followed the Greeks or the Arabians, it was chiefly, and almost only, the system of Galen which both parties adopted; and the materia medica, with a few additions by the Arabians, continued to be much the same as it had been delivered by Galen himself; being every where explained by the cardinal qualities and their different degrees, with very little reference to any thing acquired by experience.

The system of Galen, almost alone, had now subsisted in the schools of physic, from his own time in the 2d century after Christ till the 16th was pretty far advanced; and it is well known to have happened at all times, that of the persons who apply to science, the greatest part implicitly receive the doctrines delivered by their masters; which having once imbibed, adhere to them with a degree of bigotry that opposes every attempt towards innovation and improvement. Such was the condition of the state of physic with the followers of Galen at the beginning of the 16th century, that it required some violent efforts to shake off the torpor and vanquish the bigotry of the Galenic school; and although the reformation which happened was not conducted with the discretion that might have been wished, yet it was fortunate for science that such a revolution took place at this time.

It has been already remarked, that chemistry appeared first

among the Arabians; and it is probable that some of their first operations were upon metallic substances. Accordingly, we find a preparation of mercury mentioned in Rhazes; and it is pretty certain, that in the immediately following ages the chemists were busy in their operations upon antimony: for the Currus Triumphalis Antimonii, published under the name of Basil Valentine, and supposed to have been written about the end of the 15th or beginning of the 16th century, mentions a great variety of these preparations.

Although the progress of this business cannot be precisely traced, yet there is good ground to believe, that the chemists very early directed the employment of their art to the preparation of medicines; and, agreeable to the fanatical spirit which so generally prevailed among them, they conceived the idea of preparing an universal medicine, and one which should protract life to a thousand years.

How they succeeded in these visionary schemes need not now be told: but it is certain that many of them became empirical practitioners of physic; and it is probable that the medicines they employed were violent, and were therefore avoided by the timid and inert regulars of those days. One of the latter, Gordonius, author of the Lilium Medicinæ, gives us this account of the opinion which then prevailed with regard to chemical medicines: "Quia (says he) modus chemicus in multis utilis est, sed in aliis est tristabilis, quod in ejus via infinitissimi perierunt."

In this situation matters stood at the beginning of the 16th century, when the famous Paracelsus appeared. He does not appear to have studied in any of the established schools of those days; but, determined to follow his father's profession, which was that of physic, he seems to have travelled about in quest of remedies amongst all sorts of people, and particularly among the chemical practitioners of those times. From these he learned the use of mercury and antimony; and from some hardy empirics, the use of opium; at least, a more free use of this than was then common. By employing these remedies, he was enabled to cure many diseases which had baffled the inert remedies of the Galenists; and being of a bold and boastful disposition, he made the most of these accidents; while at the same time, the partiality of mankind to empiricism soon contributed to give him great fame.

He was so far more fortunate than any former chemical practitioner had been in acquiring a general reputation, that he was called to a professor's chair in the university of Basil. In this situa-

tion he found it necessary to become systematic; and making use of such theories as he could derive from his predecessors in chemistry, upon these grounds attempted a system of physic, blended with most extravagant and visionary doctrines, supported and covered by a great deal of new and meaningless jargon of his own. His lectures were chiefly employed in recommending his own chemical remedies, and declaiming in the most outrageous manner against the established schools of physic. He did not, however, continue long in this employment; for his boisterous temper engaged him in measures which soon obliged him to leave both the university and city of Basil.

His history after this is pretty well known; and it is only requisite to say, that he gave occasion to the forming a sect of physicians who appeared in opposition to the established schools, then entirely followers of Galen. The chemists employed a set of remedies which the Galenists very violently opposed; and for a hundred years afterwards, the physicians of Europe were divided into the two sects of Chemists and of Galenists. The chemists were men of little erudition and of mean parts, and delivered theories full of jargon and nonsense; but against all this the efficacy of their medicines supported them, and increased more and more their credit with the public. Their encroachments on the trade were felt by the Galenists, and produced a violent opposition, supported by all that bigotry which is common to schools long established, and of which the Galenists still held the entire possession. Upon this occasion the Galenists were imprudent: for they assailed their antagonists, not in their weak, but in their strongest quarter; and attacked, with intemperate violence, all those powerful and efficacious remedies by which the authority of the chemists was supported. This happened particularly in France, where the Galenists called in the aid of the secular arm, and employed it to oppress their adversaries.

It was in Germany that the chemical practitioners especially prevailed; and there was hardly a sovereign court in that country in which an alchymist and a chemical practitioner of physic were not retained. Even the Galenical practitioners there came soon to employ the remedies of the chemists; and Sennertus, one of the most eminent Galenists of Germany, endeavoured to reconcile the two opposite parties.

Linacre and Kay, the restorers of physic in England, were zealous Galenists; but as no regular school of physic was ever well established there, the persons destined to physic chiefly resorted

to the schools of Italy and France, where they generally became Galenists: And although the London college showed some disposition to oppress the chemical practitioners in the person of *Francis Antony*, it was more under the pretence of checking quackery than of opposing chemistry.

Very early in the 17th century, sir Theodore Mayerne, who as a chemical physician had been much opposed and oppressed by the Galenists of France, was called over into England, where he was appointed first physician to the king, and continued to hold that office for more than thirty years after. His theory and his prescriptions were very like those of the Galenists; but he was a great favourer of chemical medicines, and particularly of antimony; the medicine with regard to which the two sects were most especially divided. It does not, however, appear, that upon this account he met with any opposition from the physicians of England; and indeed, on the contrary, we find him becoming a member of, and acquiring great authority in, the London college. It is probable that his great credit put an end, in England, to all distinction between the Galenic and chemical practitioners; and as in the year 1666 the faculty of Paris rescinded their arret discharging the use of antimony, there was thereafter hardly any where a distinction to be found between Galenists and chemists.

This detail of the progress of chemical physic, and of the conflict which happened between the chemists and the Galenists, seemed necessary, in order to explain the state of the materia medica in modern times; and it merits particular attention, that in the course of the 16th century, the introduction of the more frequent use of chemical medicines, and of the more frequent application of chemistry to their preparation, produced a very great change in the state of the materia medica. Fossil medicines, and some of them entirely unknown to the ancients, came now to form a much greater part of it than formerly; and not only those of the metallic, but many of the saline kind, little known before, were now introduced. The Galenists had in some degree employed distilled waters and extracts: but now the chemists subjected a much greater variety of substances to those operations; and hence distilled waters, essential oils, quintessences, and extracts, came, with those who admitted of chemical remedies at all, to constitute almost the whole of the materia medica. Many of these preparations were indeed injudicious, and the employment of them was without discernment; but the virtues ascribed to them entered into the writings on the materia medica, and have been frequently repeated since. These

pretended virtues are often asserted as from experience; but among the many deceivers in the business of the materia medica, none have been more frequently such than the chemists.

Whilst chemistry was thus employed to modify the materia medica, it was accompanied by every species of fanaticism; by the doctrines of astral influences, animal magnetism; by pretensions to alchemy, to panaceas, and to medicines capable of prolonging life. All these had some influence on the materia medica; but none more very generally received than the doctrine of signatures; and which has had its influence even till very lately. The Decoctum ad Ictericos of the Edinburgh Dispensatory 1756, never had any other foundation than this doctrine of signatures in favour of the Curcuma and Chelidonium Majus.

The doctrines of chemistry, though attended with so many absurdities, were, however, the most promising towards explaining that quality in medicines upon which their virtues depended; and accordingly have ever since been more or less applied to that purpose. After the vague and unmeaning theories and jargon which the chemists on their first appearance introduced, the first appearance of system was that of the doctrine of acid and alkali, which continued to have a great share in medical doctrines for a long time after; so that, according to the fancy of the physician, the causes of almost all diseases were referred to an acid or an alkali prevailing in the human body; and remedies accordingly were arranged as they possessed the one or the other principle. Thus we find TOURNEFORT trying every vegetable juice by experiment, to discover in it the mark of acid or alkali: But it was soon found that this system was too general to admit of its being applied to any extent, and that it was necessary to enquire more particularly into the constituent parts of medicinal substances. At the same time, this was still expected from chemistry; and accordingly the Academy of Sciences engaged some of their members to make the *Chemical Analysis*, as it is called, of almost every medicinal substance; and which, I believe, was executed with great accuracy. It was, however, soon perceived, that substances of very different, and even of opposite qualities in medicine, gave out, in a chemical analysis, very much the same products; and it was therefore also perceived, that these analyses hardly threw any light upon the medicinal virtues of the substances treated in that manner.

It was about this time, that certain physicians, who presumed to judge of the constituent parts of medicines, partly from their chemical analysis, partly from their sensible qualities, formed plans of

the materia medica. Such was that of HERMAN the professor of materia medica at Leyden, in his little work intitled *Lapis Materiæ Medicæ Lydius:* but to any person considering this work, it will be obvious, that the author has often determined the constituent parts at random, and that his doctrine is neither clear, correct, nor applicable; though it has still remained long amongst the doctrines of the materia medica.

It has almost at all times been supposed, that the virtues of medicines were so strictly connected with their sensible qualities of taste and smell, that from thence the knowledge of their medical virtues was to be acquired. Accordingly, these sensible qualities have been generally taken notice of by the writers on the subject; and Sir JOHN FLOYER, as well as others, has thereupon attempted to build an entire system; but with little success, as we shall have occasion to show hereafter.

After all the schemes at any time formed for investigating the virtues of medicines, it will be readily acknowledged, that the conclusions formed from any of them can hardly be trusted till they are confirmed by experience; and though this also may often prove fallacious, it is much to be regretted that so little pains have been taken by our writers to obtain this test in favour of the virtues they ascribed to medicines. Some attempts, indeed, in this way have been made; and the sagacity and judgment of CONRAD GESNER, had he been at leisure to prosecute this inquiry, would have been of more service than the multitude of compilations which have been made. What has rendered the alleged results of experience less useful shall be said in another place; but in the mean time, it will be proper to take notice of two attempts which were made in England to consult experience with respect to the materia medica.

The first was by Mr JOHN RAY, who, in attempting to give a complete history of plants, thought it incumbent on him, as many other botanists have idly supposed it, proper for them to enumerate the virtues of the plants used in medicine. In this, however, Mr Ray has chiefly copied from preceding writers, and particularly from John Bauhin and Schroeder; but wisely perceiving that the proper foundation was experience, he applied to many of his friends engaged in the practice of physic; and from some of these has given us a number of experiments, which have been since transcribed by Geoffroy and other writers. Either, however, from the fallacy of experience, or from the rashness of his friends in drawing conclusions from it, the value of Mr Ray's reports is not so great as might have been expected.

About the same time Mr Boyle endeavoured to engage the practitioners of physic in the study of specific medicines; that is, of medicines whose virtues are learned only from experience. There will be occasion hereafter to consider not only in what circumstances the doctrine of specifics may be admitted, but also how it is to be properly managed; and at present it is only necessary to take notice of its effects on the state of the materia medica at the end of the last century. Mr Boyle, from the great benevolence of his disposition, was very diligent in enquiring after specific and experienced remedies; and has given us a collection of remedies which he supposed to be of this kind. From his want, however, of discernment with respect to the nature and state of diseases; from his not being sufficiently aware of the fallacy of experience, and perhaps from his being little on his guard against false information; his collection has contributed very little towards the improvement of the knowledge of the materia medica.

Soon after this, when it was perceived that the chemical analysis by the power of fire contributed nothing towards discovering the constituent parts of substances in which their medicinal virtues were especially to be found, it came to be very justly conceived, that a more simple and less violent means of resolution might better answer the purpose. Physicians and chemists, therefore, set about treating many vegetable substances, either by infusion and decoction in water, or by infusion in spirituous menstruums, and obtaining extracts in consequence of these operations; and such labours still continue to be employed with great diligence. In many cases they have been useful in ascertaining whether the medicinal virtues were best extracted by watery or by spirituous menstruums; whether the virtues resided in a volatile or in a fixed substance; and whether they were chiefly in the parts that could be separated by these operations, or only in the entire and undecomposed substance of the vegetable matter. By these labours the doctrines of the materia medica have been often corrected, and we have been thereby frequently taught not only to distinguish the different degrees of the same quality in different bodies, but they have been particularly useful in directing the most proper pharmaceutical treatment of medicines, and have sometimes afforded an analogy for judging of the virtues of untried substances. With respect to their effect in ascertaining the virtues of medicines, I think they have done very little: for whether the medicinal virtue be found to reside in a volatile or a fixed, in a gummy or a resinous part, it will still require and depend upon experience to determine what that virtue is.

We are now arrived at a period, when a number of different theories, successively or together, prevailed in the schools of physic; and which, according to the nature of their different systems, variously affected the state of the materia medica. Thus the Stahlians, in following the general principle of their system, always mysterious, have introduced archeal remedies, and many of a superstitious and inert kind; while, at the same time, trusting to the *Autocrateia*, they have opposed and rejected some medicines of the most powerful nature.

On the other hand, the mechanical physicians, by introducing the Corpuscularian philosophy; that is, the notion of the small parts of bodies acting upon one another, by their figure, size, and density, have in that manner endeavoured to explain the operation of medicines upon the fluids and solids of the human body; and have thereby introduced many false opinions concerning their virtues. It was the Cartesian physicians who first introduced this doctrine; but it was especially Dr Boerhaave, who, by adopting it, contributed to extend it to the whole of medical writers. Even at this day it has not yet passed away; for I observe that a late author, Mr Navier, and a living writer, Mr Fourcroy, have continued to explain the operation of mercury by its specific gravity.

As it has happened, that, ever since the introduction of chemical reasoning, physicians have generally considered the cause of diseases to be depending upon the state of the fluids, so they have considered the operation of medicines chiefly as changing that state; and the theory still enters to a considerable extent into the doctrines of the materia medica. I judge this to be very improper, while the state of the moving powers, and of the various means of changing that, are as yet but little attended to. With respect to this, Dr Hoffman admitted the general principle, and has this expression: "Demum omnia quoque eximiæ virtutis medicamenta, non tam in partes fluidas, earum crasin ac intemperiem corrigendo, quam potius in solidas, et nervosas, earundem motus alterando ac moderando, suam edunt operationem: de quibus tamen omnibus, in vulgari usque eo recepta morborum doctrina, altum est silentium." Notwithstanding this, he himself, in treating of particular medicines, has for the most part employed the Corpuscularian philosophy, or a very ill defined chemistry, to explain the operation of medicines upon the fluids.

Another circumstance, still affecting and injuring the writings on the materia medica, is that of referring the operation of medicines to certain general indications; most of which have arisen

from defects, both of physiology and pathology, and are neither sufficiently explained nor well understood. They are for the most part of too general and complicated a kind, and ought to be reduced at least to more simple operations; and which, if it could be done with clearness, would not only prove one of the most useful methods of delivering the materia medica, but would almost entirely destroy the doctrine of specifics, which must otherwise continue upon the most mysterious and uncertain foundation. At present, many of the general indications to which the virtues of medicines are referred are absolutely suppositious and false.

From having thus pointed out the many false sources from which opinions concerning the virtues of medicines have been derived, it will be evident that the writings upon the materia medica, being almost always compilations, must be full of mistakes and frivolous matters.

Whenever an author does not speak from his own knowledge and experience, but only informs us that a medicine has been said by former writers to have certain effects, or has been commended as curing certain diseases, he is merely a compiler, and upon a very uncertain foundation. It is impossible indeed for any man to treat of every article of the materia medica from his own experience; but surely, when it becomes necessary for him to quote the experience of others, he must be allowed to do so, but it must be with great skill and discretion in choosing his authorities; which, however, has been seldom done; and the neglect of it has filled our writings with a great deal of false experience.

Notwithstanding what I have now insinuated with respect to the imperfections to be found in the writers on the materia medica, it must be owned, that in modern times, more especially in the course of the present century, and even lately, the materia medica has received much correction and improvement.

The progress of philosophy has corrected many superstitious follies, that were formerly intermixed with the doctrines of the materia medica. Chemistry has given us many new medicines, entirely unknown in ancients times; and this science, in its progress, has not only gradually corrected its own errors, but has taught us to reject many inert medicines, which formerly made a part of the materia medica. It has taught us a greater accuracy in preparing all its peculiar productions, and to lay aside many of those operations with which it had amused the physician, and had imposed much useless labour upon the apothecary. In particular, it has instructed us how to make the combinations of medicines with great-

er correctness and propriety; and in all these respects has rendered the whole of the pharmaceutic treatment of medicines more simple and accurate than it was before.

Chemistry has thus greatly improved the state of the materia medica, and has led physicians to a discerment that should reject that luxuriancy of composition formerly so prevalent; and which, even at present, in most parts of Europe, is far from being sufficiently corrected. The reformation in this respect has not yet taken place to any remarkable degree, excepting in the northern countries of Europe, in Britain, Sweden, Denmark, and Russia. And if we look into the last edition of the Wirtemberg Dispensatory, which is of much authority in Germany, or into the Pharmacopœia Generalis lately published by Spielman, we shall perceive that a great luxuriancy of composition still prevails in Germany; and if we look into the Codex Medicamentorum Parisiensis, we shall be surprised at the many injudicious compositions, consisting of numerous and inert ingredients, which still prevail in the enlightened kingdom of France.

Having thus finished what it seemed proper to say of the general history of the materia medica, it may be expected, and will be proper, to give some particular account of the principal authors, who have treated this subject. With respect to ancient authors, it does not seem necessary to say more than I have done above; and therefore what is farther to be offered shall relate only to the chief writers in modern times.

The writers of the 16th century, such as TRAGUS and TABERNÆMONTANUS, though frequently quoted since, do not deserve much attention, as they are merely compilers from the ancients, transcribing all their imperfections, and adding some mistakes of their own. If they offer some new facts, they are on a doubtful foundation, and often manifestly mistaken. As a specimen of the writings of Tragus, let us take the following, which I am ashamed to find quoted and repeated by the ingenious Mr Geoffroy. On the subject of the Polytrichum, Mr Geoffroy has these words: "Tragus asserit illud vel solum vel cum Ruta muraria, vino aut hydromelite decoctum et per aliquot dies ex ordine potum, obstructiones jecinoris solvere, morbum regium expellere, pulmonis vitia purgare, spirandi difficultate prodesse, duros lienis tumores emollire, urinam ciere, arenulas expellere, et mulierum menses suppressos promovere." It might have been expected from the good judgment of Mr Geoffroy, that he would have concluded this account as he had done one

before, with saying, "Ejus virtutes longe remissiores et debliores esse, usus et experientia demonstraverunt."

The first writer of the 17th century whom I think it necessary to mention is, JOHN SCHROEDER; and that not for his own merit, but for his having been so long considered as an authority in these matters. He has been quoted by the latest writers; and his very words have been transcribed by Ray, Dale, and Alston; and an edition of his work, in the German language, was published in the year 1746: all which may be sufficient to show how slow the progress of discernment has been in the business of the materia medica.

In the year 1646 Schroeder published his Pharmacopœia Medico-chymica, which might have been intitled Galenico-chymica; and by uniting the Galenical and chemical pharmacy together in one book, he recommended his work to both the parties then subsisting. He is systematic, and as complete as the then state of science could well allow.

His chemistry, after the labours of Hartman, Quercetan, Libavius, and Angelus Sala, is more correct than it had been in the hands of Paracelsus and his immediate followers. He is, however, luxuriant in chemical preparations to the highest degree, and shows to what a wonderful number these had arisen in the course of a hundred years; but he is still fraught with all the folly, fanaticism, and extravagant commendation, which had prevailed among the writers of that sect. The Galenic doctrine of Schroeder, though much followed afterwards, was in no better condition. He has followed the ancients in all their faults, and has repeated after them, without any reserve, or even the smallest correction. He is still entirely in the Galenic system of the cardinal qualities and their different degrees, and is full in the doctrine of the elective qualities of purgatives. In following the ancients, he delivers the virtues of medicines by their general qualities and supposed powers, upon no proper foundation; and, I might say, very often upon a false one.

The next writer to be mentioned is JOHN BAUHIN. His botanical merit is not to be taken notice of here; and I am only to speak of what in his Historia Plantarum he has written on the virtues of those plants which make a part of the materia medica. Upon this subject he was learned; and so diligent a compiler, that he may be read, instead of all those who had gone before him. He has compiled, however, without any choice of authorities, and without omitting or correcting the mistakes that had before prevailed on the subject. He certainly did not deserve to be followed, as he has been,

by Ray, and others after him; and by no means deserves to be read now.

Not long after the work of John Bauhin, there appeared the the Botanicum Quadripartitum of Simon Pauli; which has been so much respected by after writers, that it is proper to take some notice of it here. After I had looked into this writer, I was a little surprised to find this character of him in Etmuller: "Simon Pauli, qui est elegans et simul tamen copiosus autor, atque cum judicio scripsit;" and I was still more surprised by finding this character of him in Geoffroy: Simon Pauli, vir sane doctus et ingenuus." Pauli, indeed, who lived in the literary age of Copenhagen, had much erudition; but it was of the most frivolous kind, and without affording any correction of the imperfections and mistakes which had appeared in the writers whom he quotes, or showing any choice in the authorities he makes use of. He gives us often his own observation and experience: but the result of them is commonly so improbable, that I can give him little credit; and hardly in one of twenty instances in which Mr Geoffroy has been pleased to quote him. His accounts are often delivered with such a trifling garrulity, that it is impossible to consider him as a man of good sense; and from much experience I have now formed an opinion, that from men of weak judgment facts and pretended experience are not to be relied on.

Soon after Simon Pauli appeared Georgius Wolfgangus Wedelius, who, in a work under the title of Amænitates Materiæ Medicæ, has attempted to reduce the subject to principles; but both his physiology and pathology are so imperfect, that I cannot find him to have thrown any light upon the business. He is still an abettor of the doctrine of signatures, as well as a believer in the power of amulets; and with regard to what he says further of the virtues of particular substances, he seems to be entirely guided by those who had gone before him.

There is hardly any notice due to Emanuel Koenig, who, towards the end of the last, or soon after the beginning of the present century, published on all the parts of the materia medica: He also attempted to reduce the matter to principles; but he does it in a very imperfect manner, and there is not a folly in any foregoing writer, that he does not discover in his work. In treating of particular substances he is a mere compiler, with as little judgment as any we have upon the subject.

Jean Baptiste Chomel begun to read lectures upon the materia medica about the beginning of this century, and published his

Abregé de l'Histoire des Plantes usuelles in 1712. The work does not appear to me to be a very valuable one; but there have been repeated editions of it, and the last by his son in 1761, shows me that much improvement in the knowledge of the materia medica had not made any progress in France.

Mr Chomel, however, has his merit. He does not transcribe Schroeder as many others had done. He has entirely omitted the Galenical doctrine of the cardinal qualities and their degrees; and though he was an eleve of the great Tournefort, he does not repeat after him the explanation of the virtues of plants by the oils, salts, and earths, which the chemical analysis had seemed to point out.

Mr Chomel has chosen, as I judge, a proper plan of arranging the subjects of the materia medica, according to the similarity of their virtues in answering the general indications of cure. In this, however, he appears to be extremely imperfect. He has hardly upon any occasion explained these indications in a manner that can at present be admitted. Many of them seem to be absolutely improper; and most of them, if at all admissible, are too complicated to be employed with any clear instruction or even with safety to students.

Under the same titles he has often associated plants of very dissimilar, and even of opposite nature and qualities; and he has often inserted inert substances, that did not deserve to have a place any where.

Besides giving the general qualities, he mentions particular virtues which might not seem to arise from the general qualities. In this, however, he is not very fortunate, as he found it necessary for him to repeat after the writers that had gone before him. He does not indeed transcribe Dioscorides and Galen so much as others had done; but he has not omitted their opinions so often as with propriety he might. In quoting his modern authorities, he does not make the selection nor show the judgment that might be desired. Tragus, Tabernæmontanus, Matthiolus, Zacutus, Schroeder, John Bauhin, Simon Pauli, Etmuller, Koenig, Boyle, and Ray, are not necessarily bad authorities: but they are certainly such when they deliver very improbable events; and their being quoted for such, frequently occurs in Chomel.

Chomel himself should be valuable, by his frequently reporting his own experience: but in a variety of instances he does this with respect to many substances which we presume to be very inert; and with respect to many, when the power ascribed, and the cures said to be performed, are very improbable. Perhaps, however, too

much has been already said of this author; and it would be tedious to point the many instances that might be mentioned of his incorrectness and mistake.

Stephen Francis Geoffroy was a man of genius, and in many respects of good judgment, though this does not always appear in his writings on the materia medica. In his book on this subject, when treating of vegetables, he gives us an exact account of the analysis made by the direction of the academy of sciences: These are now not considered as of much use; but Mr Geoffroy often attempts to explain the virtues of plants by the salts, oils, and earths, which they seem to contain: in which, however, he gives little instruction; and as we have said above, the doctrine in general is false and ill founded.

In giving particular virtues, Mr Geoffroy seldom does it from his own experience, and generally upon the authority of former writers; and in this he does not show much judgment, either in selecting those authorities, or in correcting either their extravagant commendations or their manifest mistakes. An example of this has been already given in one of the quotations he makes from Tragus; and in many other places he appears equally injudicious in quoting from that author. I have mentioned above his character of Simon Pauli, and have given some reasons for my thinking it ill-founded; but the best proof of this are the very quotations which Mr Geoffroy makes from him. On the subject of vegetables, in almost every page Mr Geoffroy quotes from Pauli; but seldom with much judgment. I can by no means admit, upon the authority of Pauli, that Carduus benedictus can heal cancers, or that the Anonis can be a certain remedy for a stone either in the kidneys or bladder. In repeating such accounts, Mr Geoffroy appears to me injudicious; and he is certainly trifling in qouting Pauli, for the use of the distilled water of Aparine. It will hardly now a-days be received upon the authority of Pauli, that the seed of the aqualegia has been of great use in the small-pox and measles, and still less that it has the power of assisting in the birth of children; and it gives no credit to the judgment of Mr Geoffroy, that he confirms the virtues of this seed by his own experience. Mr Geoffroy quotes the authority of Simon Pauli for the bellis minor being highly useful in the cure of some desperate cases of phthisis pulmonalis; and it is a weak supplement to the authority of Wepfer, which, however, in this case is hardly sufficient. Upon the authority of Simon Pauli it is difficult to believe that the decoction of clove-julyflowers had served to free numberless persons from malignant fevers. To conclude, Mr Geof-

froy can receive no credit by repeating after Pauli, that the Argentina, by being put into the shoes of the patients, had proved useful in dysentery and all kinds of hæmorrhagy. I have now said enough of Mr Geoffroy's injudicious quotations from Simon Pauli, and I could give many instances of his being equally injudicious with respect to the other writers whom he quotes; so that from this, and many other circumstances, his compilation may be judged to be of very little value.

Mr Geoffroy in his own life-time did not complete his treatise on the materia medica, leaving a great number of the indigene plants of France unmentioned; but his work was so much valued, that it was thought proper to give the public a supplement, which has been done in three duodecimo volumes. This indeed is executed very much in the manner of Mr Geoffroy's own work; but notwithstanding the great name which in the preface is said to have reviewed it, I must take the liberty of saying, that in quoting authorities the supplement is equally trifling and injudicious as the work of Mr Geoffroy himself; so that upon the whole, it is of very little value.

In the list of writers on the materia medica, I cannot omit the Synopsis Universæ Praxeos Medicæ by Mr LIEUTAUD. The second volume of this work, which is entirely de Medicamentis, may be considered as a treatise of the materia medica; and though it be such as I cannot esteem, yet as being a late publication by a man of the highest rank in the profession, I think proper to take notice of it, as marking for the time the state of the materia medica in one of the most enlightened nations of Europe.

MR LIEUTAUD has distributed the subjects of the materia medica according to the general qualites by which they are adapted to the several indications arising in the practice of physic: but it must be observed, that the indications marked are for the most part ill defined, too general, as well as too complicated, to convey any instruction to young practitioners; and they are truly exposed to all the objections I made to those of Chomel. Let us take as an example Mr Lieutaud's title of Febrifuga. Under this title, of the substances enumerated, some are astringent, some are bitter, others aromatic; even the aloe and gummi gutta are inserted; and, on the same ground, fifty more might have been added. Very possibly most of the substances mentioned, may upon one occasion or other, be employed in the cure of fever; but they are certainly adapted to different circumstances of the disease: and as they are here huddled together, they can give no instruction, and may often

mislead. From this article, and from many others, it may be observed, that Mr Lieutaud might have given a more useful arrangement, by throwing together the medicines of similar qualities; but in this and every other enumeration in his book, he has given the several medicines in a promiscuous and very discordant order. Under the article of *Febrifuga*, the enumeration of his *emporetica* proceeds in this manner : "*Radices taraxaci, foeniculi, pentaphylli, asari, gentianæ*;" and yet there can hardly be a more discordant set of substances.

These, however, are not the only faults of Mr Lieutaud's enumerations; for in many instances, substances are enumerated that do not at all belong to the title under which they are placed. Thus, under the title of Antiputrida, we find various animal substances; under Refrigerantia, there occurs *Cerevisia*; under Astringentia, there are the *Sophia chyrurgorum*, *Bursa pastoris*, and *Polygonatum*; under the Stomachica is put the *Iris Germanica*; and under Emollientia the *Senecio*. These are mistakes which perhaps may be considered as oversights *in opere longo*; but there are some general opinions, deliberately given, which cannot so easily admit of excuse. In almost every one of his enumerations, we find substances, either absolutely inert, or of so little power, that for a long time past they have been entirely neglected in practice. Mr Lieutaud, however, has found virtues in them which no body else can discover. Such, amongst others, are the Distilled waters which he frequently prescribes; and which, notwithstanding his vindication of them, have been properly rejected from most of the dispensatories of Europe, excepting that of Paris.

The *Ebur*, *Cornu cervi præparatum*, *Cranium humanum*, *Ungula alcis*, *Pulvis bufonum*, *Cortex suberis*, and many others of like kind, if they were to appear in prescription, would, in Britain at least, effectually disgrace a practitioner. Some preparations, formerly commended and in use, are now by many thought to be inactive and superfluous; as the *Cinnabaris factitia et antimonii*, the *Antihecticum Poterii*, *Antimonium diaphoreticum*, *Æthiops mineralis*, and some others of at least disputed virtue; but Mr Lieutaud retains them, and sometimes with much commendation of their virtues. In treating of particular subjects, he does not, like Chomel and Geoffroy, choose to quote his authorities; but he manifestly repeats the common-place accounts of former writers, and is every where liable to the censure which Galen applied to Dioscorides, of ascribing too many virtues to the same substance. Like many other writers, he imputes to several medicines very improbable effects.

He mentions the Fragaria and Dens leonis as being remedies *in pollutionibus nocturnis*; the Radix graminis as being anthelmintic and lithontriptic; the *Bedeguar* employed for the cure of the bronchocele; *Coffee* as useful in preventing rickets; *Polypodium* in the cure of schrophula; and the *Euphrasia* as mending the *visus* imbecillitas in senibus: He mentions the *Avena* as proper *ad fugandam puerperarum lac*; and there can be nothing more remarkable than his account of *Cerevisia* bringing on strangury and a *gonorrhœa spuria*. He recommends many substances for healing internal ulcerations, for the most part an improbable effect; but his commending the *oleum terebinthinæ* for this purpose seems to me a very dangerous doctrine.

Many other mistakes, inaccuracies, and even frivolous things, might be pointed out in this work; but it is believed that enough has been said to show that it cannot be consulted with any advantage, nor even with safety.

I have insinuated above, that Mr Lieutaud's work might be considered as showing the state of knowledge on this subject in France at the time of its publication; and it certainly may be considered as showing it to be then in many persons of that country in a very imperfect condition; but it may be alleged that Mr Lieutaud, who was little engaged in practice, who lived very constantly at Versailles, and had little communication with the literature of Paris, cannot be considered as giving a proper specimen of the learning and judgment which prevails among the many ingenious men who are to be found in that city.

Since the time of Mr Lieutaud, there has been published at Paris a Traité de Matiere Medicale, extraite des meilleurs Auteurs, et principalement du Traite des Medicamens de M. de Tournefort et des Lecons de M. Ferrein. This work I consider as superficial and incorrect, and in every respect unworthy of Mr Ferrein, who was a man of learning and judgment, and, if he had been still in life, would never have countenanced the publication.

Some amends for this has been made by the publication of the Precis de Matiere Medicale, par M. Venel. This is a posthumous work, and which perhaps the ingenious author, if he had lived, would have given himself in a more perfect state; but even as it is, the public are indebted for it to Mr Carrere. It appears to me the most judicious writing that has yet appeared in France upon the subject; and the perusing it frequently recalls to my mind these two lines:

"Poets lose half the praise they would have got,
"Were it but known what they discreetly blot."

Mr Venel is remarkable for omitting the many idle things which former writers repeated after one another; and he has gone still further in correcting many of those prejudices which prevailed among the vulgar physicians and writers upon this subject. His chemistry and pathology are not always correct; but are always ingenious, and often probable; and if he had continued to study the subject, there is every reason to believe he would have rendered it more complete and perfect. Mr Carrere, by his notes and several useful additions, has done a great deal to this purpose, and has rendered the work very valuable.

I proceed now to the writers of Germany. Of these, Zorn, as in the style of Linnæus compilatissima, and G. Henry Behr, as superficial and incorrect, are below criticism. Buchner and Loesecke are more respectable; but any instruction they afford on the subject of the materia medica is extremely imperfect.

The first writer of Germany who deserves our notice is John Fred. Cartheuser, the author of the Fundamenta Materiæ Medicæ; which is a writing of deserved reputation. The author has distributed the several subjects according to their sensible qualities, or to their more obvious chemical constitution; and by this he has very properly associated many substances by their natural affinities. This, however, does not go throughout; for under several of his general titles, such as those of his X. XIV. XV. sections, he has often associated substances of very dissonant qualities and virtues, while by the same distribution he has separated substances of very similar qualities, and therefore such as should have been with some advantage viewed together.

Upon particular subjects he has given, with great exactness, the chemical constitution of substances, according as they are volatile or fixed; as they are saline, oily, gummy, or resinous; and as these parts of bodies are obvious without any violence of fire applied. He has given this account from his own experiments; and by these, as well as by those of Newman and of some others of a like kind, we are often well instructed in the most proper pharmaceutic treatment of medicines: but from experiments of that kind we seldom obtain much light with respect to the medicinal virtues.

As to the medical virtues of substances, Mr Cartheuser is not much wiser than others: He often attempts to explain the virtues of medicines by their chemical constitution, but in no satisfying manner. His account hardly goes farther than that medicines are more or less active; but he does not at all explain the various mo-

dification or application of that activity. With respect to particular virtues, he repeats very much after preceding authors; and in general, like them, ascribes too many virtues to the same substance; so that he seldom gives any useful instruction.

It may be remarked also, that he has employed general terms, which are not only ill defined, but also very often complicated, and sometimes altogether improper. As an example of this, and indeed of the extravagance of writers on the materia medica, here is Cartheuser's account of the virtues of zedoary: "Vires medicæ hujus "radicis maxime quidem volatili principio oleoso camphorato ad-"scribendæ sunt, valde nihilominus activitatem ejus fixa quoque "principia resinoso gummea augent. Militat inter efficacissima ta-"metsi paullo calidiora medicamenta discutientia, sudorifera, alex-"ipharmaca, pectoralia, cardiaca, stomachalia, carminativa, anthel-"mintica et uterina, ac rite usurpata, eximium subinde auxilium "in morbis exanthematicis, febribus malignis et catarrhalibus ad-"fectibus frigidis rheumaticis, cachecticis et oedematosis, tussi et "asthmate pituitoso, anxietatibus præcordialibus, dyspepsia, dyso-"rexia, vomitu, diarrhœa mucosa, cardialgia et colica vere flatu-"lenta, fluore albo, suppressione mensium chronica, partu difficili, "et placentæ uterinæ retentione præstat." *Cartheuser*, Sect. XIV. § 3. This is certainly extravagant; and that any instruction can be properly derived from it, I cannot perceive.

In 1758, the late learned and industrious Rud. Aug. Vogel published his work, intitled Historia Materiæ Medicæ. The subjects of the materia medica are here distributed according as they are taken from the leaves, from the roots, or from other parts of plants, which form no connexion in the materia medica. He likewise distributes these subjects according as they are usitata, minus usitata, and obsoleta; and such a distribution might have its use: but that of Mr Vogel cannot have much, as it is not taken from the nature of the substances themselves, as more or less fitted for use; but from the practice of a particular country, which cannot afford much instruction; for in Mr Vogel's lists many are marked as usitata which are not at all employed in Britain, and in his obsoleta many that are still frequently employed here.

In treating of particular substances, he repeats after others with no nice selection of authorities nor with sound judgment on the nature of the subject. He renounces all principles deduced from reasoning; and holding he is to give only what experience has taught, he, in the first place, gives us a list of specifics; and I shall here mark several of these as specimens of his judgment and ex-

perience. Thus, ad podagræ dolores leniendos, *Bufo ustus;* ad phthisin, *Plantago, bellis;* in ictero, *flores cheiri;* in alvi profluvius, *bolus Armena, chrystallus montana;* in sarcocele, *Sambuci flores;* in rachitide, *Sarsaparilla;* ad scabiem, *Hedera terrestris, Bonus henricus.*

To conclude, with respect to what may enable us to form a judgment of Mr Vogel, let us take one other specimen from what he says of hirundo: "Integræ hirundini virtus tribuitur analeptica, "et ad visus hebetudinem specifica. Pullum, si quis comederit, "angina per totum annum non periclitari; servatum e sale cum is "morbus urget, combustum, carbonemque ejus in mulso contritum et epotum, prodesse *refert e Plinio Celsus!*

Another German professor, Henr. Jo. Nepom. Crantz, has given us a treatise of the Materia Medica et Chirurgica. Here is a modern author who in my opinion has done nothing to advance the knowledge of the materia medica. He does not indeed like Vogel disclaim principles; but those which he employs are seldom scientific and judicious. He transcribes from the ancients with as little discernment as those who had written before him; and although he has been at pains to collect the latest discoveries, or pretended discoveries, in the materia medica, yet it is seldom with any mark of his own judgment, either in chemistry or medicine; so that upon the whole his compilation is of very little value.

The late professor Spielman of Strasburg has given us Institutiones Materiæ Medicæ, in which he has distributed medicines according to their indications; and in reducing the indications to a lesser number, he has been more chaste than many who had gone before him. This brevity, however, has often rendered him obscure; and his general titles can hardly be applied to any use. In delivering the virtues he is commendably concise, but becomes thereby in many cases superficial. He is very fond of quoting Hippocrates and Galen, but does it in many instances where the authority of these venerable ancients is of little weight.

Besides the institutions, Mr Spielman has published a Pharmacopœia Generalis; in the first part of which he has given a materia medica full of superfluities; and with respect to the virtues of the substances in use, he is surperficial and incorrect. In the second part, or the proper pharmacopœia, he has also much superfluity; and by the luxuriancy of composition which he almost every where exhibits, discovers to me an absolute want of all discernment in the business of the materia medica.

To make amends for the errors and defects of preceding wri-

ters, the public have now received the Apparatus Medicaminum of the very learned and ingenious professor MURRAY* of Gottingen. This work is not yet finished; but it promises, when concluded, to be the most complete and perfect that has ever appeared upon the subject. In so far as it has yet proceeded, the author with great judgment and medical discernment has, from former writers, and more especially from those of latest date, collected every thing which deserved to be repeated. He every where discovers an intimate acquaintance with all the writers on the subject, and always makes a judicious selection of what they afford. By his distributing the vegetable substances according as they belong to the several natural orders marked by the botanists, he has associated the substances of similar qualities and virtues, in a manner that may be of great advantage to students.

This author, who is a native of Sweden, does credit to his country, and has deservedly received honours from it; but from his present situation at Gottingen, I have classed him amongst the writers of Germany, and shall next proceed to mention those who more strictly belong to Sweden.

Of these, the first to be taken notice of is the very respectable CAROLUS A LINNE, from whom we have, as it is now published by Schreber, a complete treatise of the materia medica. Before offering any opinion respecting this work, it will be proper to remark, that in another treatise this learned author has shown a very sound judgment. What I allude to is, the Censura Simplicium, published in the fourth volume of the Amœnitates Academicæ; in which the list of Excludenda seems to me every where proper and judicious, correcting in many instances the errors and futilities

* Since the publication of Dr CULLEN's work, the world has had to deplore the loss of this excellent man, who died at Gottingen in the year 1791. He lived to publish five volumes of his *Apparatus*; and after his death there was published a sixth volume, much smaller, and I think less finished, than either of the preceding. Professor MURRAY did not live to treat of any of the mineral substances that are employed in medicine. This task was undertaken by his colleague Professor GMELIN, a man of acknowledged learning, and of vast labour. He has not, however, executed the task with much ability. Indeed, the Apparatus Medicaminum, as continued by Mr GMELIN, is a most indigested work, which it is impossible to read with satisfaction, but which may, certainly, be consulted with advantage.

Mr ALTHOF, who succeeded MURRAY as professor of materia medica at Gottingen, has published a new edition of the Apparatus (the part relating to vegetables), which is, in several respects, more valuable than the original work.

of former writers. In his list of Addenda, indeed, as well as in his Plantæ Officinales, there are many articles which are doubtful; but it is not necessary to point them out here.

After Linnæus had, in the Censura Simplicium, shown so much judgment in rejecting the inert and superfluous, it is rather surprising to find so many of these substances still mentioned in his Materia Medica, which he himself marks as superfluous, and which ought to have been omitted altogether. Besides, nothing can be more frivolous than what he has given respecting the substances taken from the animal and mineral kingdoms; for at least three-fourths of them neither are at present, nor in any shape deserve to be employed.

The subjects of the vegetable kingdom are distributed according to his own botanical system; and as that in several places admits of natural orders, it is in so far useful: but this does not go the length of rendering the distribution in general proper. Upon particular subjects, he seems disposed to ascribe too many virtues to every substance, both in the articles of VIS and USUS. In the latter article there may be information to persons well acquainted with the subject; but in many instances it is doubtful, and, in my opinion, very frequently ill founded. With respect, however, to the whole that Linnæus has delivered on the materia medica, from vegetables, our attention is very much superseded by the work given us on the same subject by his scholar BERGIUS.

The Materia Medica ex Vegetabilibus, by PETRUS JONAS BERGIUS, is a work truly of great value, and very much deserving our notice. It is precisely upon the plan of Linnæus; and therefore the same observations we made on the distribution of that author may be applied to it. We have here, however, a very valuable addition to Linnæus, in the article of FORMA, which gives a very full and very exact description of the substances used in the materia medica. Where the substances are used in their recent state, the description is of all the several parts of the plant; which, I believe, is every where exact, and may be useful, though perhaps it was not always necessary. But with respect to these substances which we know, and use only in their dried state, the descriptions of Bergius are very proper, and, as being particularly correct, must be very useful.*

* The Materia Medica Americana potissimum regni vegetabilis of SCHOEPF, printed in 1787, may be mentioned in this place. This author follows the sexual arrangement of Linnæus. He does not often appear to much advantage as a

In the article of PROPRIETAS, which comes in place of the QUALITATES of Linnæus, Bergius has made a great improvement, in giving the sensible qualities of the substance as used in medicine, both in its recent and dried state, and leads us often to determine how far medicinal virtues are connected with the sensible qualities.

In the articles of VIS and USUS, Bergius, in ascribing virtues, is much more chaste and correct than Linnæus: but indeed the manner of treating the subject is in both writers liable to doubt and obscurity, and neither very fit nor sometimes perhaps very safe for the purpose of informing students.

After these remarks on the work of Bergius, I must add, that he has given a very valuable addition in the observations which he has subjoined to almost every particular subject. In these he has communicated much useful instruction with respect to both the medical qualities and the pharmaceutic treatment; but I can say no more of these observations here than to recommend them earnestly to the reader's attention.

It now only remains to mention the British writers, who have been always very few deserving our notice. Of Mr RAY enough has been already said; and Dr DALE, as being chiefly a transcriber of Schroeder, has made no improvement with respect to the medical virtues. Dr ALSTON, my late worthy colleague, has given a treatise that must be supposed to have been composed long before its publication. It is not without many faithful observations derived from his own experience; but his transcripts from Schroeder, and others of no better authority, render his work very tedious and of little importance.

We have had a bulky work on the subject from the well-known Dr HILL. It is merely a compilation, without selection or judgment; and neither in that work, nor in his particular dissertations, so far as he refers to his own experience, he is not received in this country with any credit.

The only English work that does any credit to the country, or has made any improvement in the materia medica, is the Treatise of the late Dr LEWIS, and especially as published and judiciously enlarged by Mr AIKEN. As Dr Lewis had undertaken to treat of all those subjects which had appeared in the lists of the London and Edinburgh Dispensatories, so he had from this last introduced a

correct observer; and his work is disfigured by too many instances of credulity. It may, however, be consulted, with some profit, by the American student of medicine.

great many which did not deserve a place; and I think Mr Aiken has with great propriety marked out those which have been since expunged by the Edinburgh College themselves. When these articles are thrown aside, the rest of Mr Lewis's work is one of the most judicious that had at that time appeared on the subject. Not to mention his correct descriptions of drugs, and his useful experiments in their treatment, by different menstruums, he is very chaste in ascribing virtues, and in repeating from former writers; and from his own experience, as well as that of the most skilful London practitioners, he gives a sounder judgment of the real virtues of substances than had been given before.

There yet remains another British writer to be mentioned, and that is the late worthy Dr Rutty of Dublin, the author of the Materia Medica Antiqua et Nova. He tells us it has been a work of forty years; which to me, who think there is little to be learned from the ancients, is no great commendation. He has compiled very faithfully from the ancients, not even omitting Galen's account of the cardinal qualities and their degrees; and as he has repeated all the follies and imperfections that I have alleged are to be found in the ancients, I cannot find this part of Dr Rutty's work to be of any use; and with students it may often mislead. Dr Rutty has given a very large list of the materia medica: but as in that list he has inserted a great number of substances absolutely inert, or nearly so; as he has inserted many superfluous, as having in a lesser degree the same qualities with others, and many, which, by their being inert or superfluous, have now become obsolete; his work is no way useful in proportion to its bulk. When he treats of medicines which are still in use, he gives us some observations of his own; but for the most part he repeats the common-place accounts with no singular judgment, and generally ascribes too many virtues to the same medicine.

I have thus endeavoured to give a History of the Materia Medica; and have taken the liberty of offering the judgment which I have formed of the chief writers who have written upon it. As there has occurred more occasion to blame than to commend, it has been a disagreeable task; and I am afraid that the public opinion may be offended by my disparagement of the Ancients. I deemed it proper, however, to hazard this, because I trust, in the progress of this work, the judgment I have offered will be fully justified; and it seemed necessary to inform students from whence they might most properly and safely draw their instruction, and be put upon their guard against opinions which might deceive and mislead them.

A TREATISE

OF THE

MATERIA MEDICA.

INTRODUCTION.

BEFORE entering upon the consideration of particular medicines, it may be proper to treat of what in general relates to the operation of all of them. There are certain principles which have a reference to the whole; and by explaining these in the first place, we shall not only save afterwards much repetition that might otherwise have been necessary, but, by having laid down these general principles, it may be possible, in a more simple and clear manner, to explain the operation and virtues of particular medicines.

It is the more requisite to enter upon the consideration of those general principles, that there are several to which physicians do not appear to have given the attention which seems to be necessary. Besides, it is well known, that with respect to the justness and propriety of many of the principles which have been adopted, physicians are very far from being agreed: and I therefore deem it necessary to offer my peculiar sentiments with respect to many of those principles that have been before assumed, and more necessary still to explain certain new principles which I shall think it requisite to employ. In the last, indeed, I perhaps hazard a great deal; but every part of science is still imperfect, and must for ever remain so, if attempts be not made to improve it.

With these views, it is to be remarked, in the first place, as a principle commonly assumed upon this subject, that few or no medicines act upon the living human body in the same manner, and with the same effects, as upon inanimate matter; and it is now well known, that the operation and effects of substances applied to the living human body, are for the most part altogether different from

the effects of the same application to the dead body. Few indeed, or none, of these substances which are considered as medicines, have any effects at all upon the dead body; and therefore, assuming this as a principle, when hereafter I shall have occasion to speak of the action of substances upon the body, it must be constantly understood to be their action upon the living body only; and at least with very few exceptions, which shall be taken notice of when occasion requires.

Having assumed this principle, it must be obvious, that, in order to consider the operation of medicines in general, it will be proper to begin with explaining the peculiar circumstance of the human body, by which it is thus capable of being acted upon in a peculiar manner by other bodies applied to it; and it will also be requisite to enquire concerning the manner in which the general operation of medicines may be variously modified, according to the different states and circumstances in which the human body may be upon different occasions.

CHAPTER I.

OF THE ACTION OF MEDICINES UPON THE BODY IN GENERAL.

IN these days, it is hardly necessary to show that the action of other bodies upon the human, is chiefly by the impulse of these bodies upon the extremities or other parts of the nerves of the human body; in consequence of which, a motion is propagated from the place of impulse along the course of the nerves, to their origin in the brain or medulla spinalis; and that, upon such occasion, there does for the most part arise a *sensation.* This again generally gives occasion to a *volition;* whereby a motion is produced, which being determined along the course of the nerves into certain muscles, or moving fibres, the action of these, as well as the various effects which their action is suited to occasion, are in consequence produced.

This is the general idea of the connection of the human body with the other parts of nature; or of the manner in which the human body is acted upon by other bodies, and in its turn acts upon these. That condition by which it is fitted to have peculiar effects produced in it by the action of other bodies, is called its *Sensibility;* which seems to be lodged in every part of what we can discern to

be parts of its nervous system: And that condition of the body by which certain parts of it are fitted to have certain motions of contraction excited in them, either from a communication with the nervous system, as expressed above, or by an impulse directly made upon these parts themselves, is termed the *Irritability* of the body; which seems to exist only in the muscular or moving fibres, probably of a peculiar structure suited to that purpose.

From all this, we come at this conclusion, That the peculiar effects of substances in general, or of those substances in particular which we call *medicines*, when applied to the human body, depend upon their action upon its sentient and irritable parts.

It is, however, to be remarked here, that the action of substances in producing their effects, is not universally, as insinuated above, by the intervention of sensation and volition; for these effects are often produced without either the one or the other. At the same time it is probable, that in all cases the effects produced by the action of other bodies upon the human, although not accompanied with sensation, yet are produced by their action upon the sentient parts; and it is likewise probable, that in the case of action unaccompanied with any volition, both the action and its effects, depend either upon the application of those bodies directly to the irritable parts, or upon their application to sentient parts, which determine motions into those very nerves wherein motions are commonly excited by volition. Upon the whole, it is sufficiently probable, that the peculiar action of medicines depends upon the sensibility and irritability of the human body; or, in other words, that it universally depends upon motions excited and propagated in the nervous system. These, therefore, are the conditions of the living body which we were engaged to explain. What is the nature of the matter in which these motions take place, or in what manner it is inherent in the nervous system, is not well known: but we think it may be justly held as existing, and may speak of it under the appellation of the *nervous power*. As it appears only in the living, and disappears entirely in the dead state of the body, it may be otherwise properly enough termed the *vital principle*.

It does not seem necessary to explain fully here the various laws by which the motions of the nervous system are regulated and governed: but with respect to the operation of medicines, this in general is to be observed, that as there seems to be a possible communication of motion from every part of the nervous system to every other part of it; so medicines, though applied to one small part of the body only, do often, in consequence of the

communication mentioned, show their effects in many other parts of the body.

This sympathy or consent, as it is called, of the several parts of the body, is in general very well known to physicians; and I shall have occasion frequently hereafter to take notice of it, in mentioning the effects depending upon it, and the laws by which it is governed. At present I am to prosecute the consideration of it no farther.

Having now considered the action of medicines as in general upon a living body, it may, in the next place, be observed, that as the effect of the action of one body upon another does always depend, partly upon the general operation of the body acting, and partly also upon the particular circumstances of the body acted upon; so it is well known, that as the human body is in several respects considerably different in different men, and even in the same person at different times, so the operation of medicines upon it must be variously modified according to the different circumstances in which the body may happen to be, and that, either throughout the whole of life in different men, or upon particular occasions in the same person.

It is therefore necessary, before going further, to consider those differences in the state of the human body which may occur and give occasion to a difference in the operation of medicines upon it. We shall, therefore, proceed to consider those constitutional differences which take place throughout life, under the title of *Temperaments*, this being the appellation under which these diversities are commonly mentioned.

SECT. I.

OF TEMPERAMENTS.

In attending to the great number of circumstances in which the bodies of men may be different from one another, it is scarcely possible to enumerate every particular: but it has been at all times presumed, that a great number of these circumstances are commonly combined together in the same person; and that frequently one man shows a combination of circumstances not only different, but sometimes of an opposite kind to that of another. Such combinations, upon a particular supposition with respect to their causes, the ancients named *temperaments;* and the term has continued to

be employed in the schools of physic from the most ancient to the present time.

Abstracting from all theory, we continue to employ the same term to denote a combination or concurrence of circumstances which happens in certain persons, but which in several respects is different from the combination that happens in certain others. Upon this footing, I believe the ancients distinguished what they called the different temperaments of men: for it is probable that at first they distinguished them by actual observation; but very soon they formed a theory with regard to them, from whence they formed appellations which have continued to be applied to them ever since. The appellations indeed have been continued, though the theories which laid the foundation of them have been long ago exploded; and the moderns have neither by observation extended the ancient distinctions, nor, though they have often attempted it, have they ever given, so far as I can judge, any happy explanation of the causes or foundation of the distinctions they have so generally adopted. I believe it will be generally allowed, that this part of medical doctrine is still in an embarrassed and undetermined state.

In treating the subject, philosophy would require that I should in the first place distinguish temperaments, by marking the external and observable circumstances which are found with some steadiness to be commonly combined together: but this I find a difficult task, and what my observation has not been so extensively applied to, as to enable me to perform in the manner I would wish. I must therefore proceed in another way; and shall endeavour to consider those circumstances of the internal state of the human body which may give occasion to a difference in the state of the functions, and even in the external appearances which distinguish different men.

These circumstances may, I think, be referred to five general heads according as they occur, 1*st*, In the state of the simple solids; 2*dly*, In the state of the fluids; 3*dly*, In the proportion of solids and fluids in the body; 4*thly*, In the distribution of the fluids; and, 5*thly*, In the state of the nervous power. With respect to each of these heads, I shall now offer the best remarks, and give the best explanation, that the present state of our science seems to me to admit of.

Article I. *Of the simple Solids.*

Whether these are in certain parts of a fibrous, or if they are entirely of a cellular texture, it is not necessary to determine here. It is enough for our purpose, that they are at different times of a

different degree of density and firmness. This particularly appears in the progress of life, when from an almost fluid state they are gradually changed into a more dense and solid substance.

The ancients marked the difference of temperament by the colour and strength of the hair of different persons; and many experiments show that the strength of the hair does for a great part of life follow the density of the simple solid in other parts of the body. Dr Brian Robinson, in his Treatise of the Animal Oeconomy, has by many experiments clearly shown, that the density and strength of the hair increase with the age of the person; and therefore, that the state of the hair is correspondent to that of the simple solids in other parts of the body. It is true, indeed, that the state of the simple solid may in different persons be considerably varied by the difference of diet, exercise, climate, and other the like circumstances: but at the same time, as the state of the solid seems to be often an hereditary condition, and as it frequently shows itself very early in life, before the circumstances just now mentioned can be supposed to have modified its state; so it is highly probable, that the state of the simple solid depends upon the difference of the original stamina of the body: and as that difference will proportionally prevail throughout the whole of life; so, notwithstanding the circumstances in the manner of living, it will always have its share in producing a difference in the state of the solid in different persons at the same period of life.

Whilst, therefore, a difference in the state of the solid must occasion a difference in the whole of the state of different persons; so it must be admitted, that a difference in the state of the simple solid must at all times have a share in distinguishing the temperaments of men.

It being, however, farther probable, that the state of the moving fibres is in some measure modified by the state of the simple solid; so likewise it is probable, that the simple solid, according to its state of density and elasticity, must have a great share in determining the strength or weakness of the moving fibres, and consequently of the whole system, so as in this manner especially to have a very powerful influence in distinguishing the different temperaments of men.

It here merits particular notice, that as the state of the simple solid is for the most part likely to be proportionally the same throughout the whole of life; so there is reason to believe that, from incidental and sudden changes in the state of the simple solid, diseases will seldom arise. This indeed may possibly be affected

by various incidental causes: but they are either such as very rarely occur, or such as cannot be applied at once to a considerable portion of the system; and which, for the most part, take effect only when applied for a great length of time. I am persuaded, therefore, that those sudden changes which frequently occur with respect to the debility and strength of the system, cannot be imputed to changes in the state of the simple solid, which cannot suddenly take place, but must be imputed to changes in the state of the moving fibres, *quem facile mille res turbant*. Dr BOERHAAVE gave little attention to the circumstances last mentioned; but whoever studies this subject, will perceive that the illustrious Professor's doctrine *de fibra laxa vel rigida*, as explaining the causes of the *fibra debilis vel fortis*, will not apply so extensively as he has supposed; and consequently, that those powers of changing the state of the simple solid which have been imputed to internal medicines, are seldom to be regarded; or at least never without a number of limitations, to which little attention seems to have been hitherto paid.

ARTICLE II. *Of the State of the Fluids.*

FROM the earliest accounts of physic with which we are acquainted, it appears, that from the most ancient times down to the present, physicians have been attached almost entirely to the study and consideration of the fluids; and from the supposed state of these, have endeavoured to explain the phenomena both of health and of sickness. In this, however, they appear to me to have been unfortunate: for, not to mention the imperfection and falsehood of the many speculations, both of Galenists and chemists, which have formerly prevailed on this subject, I would venture to assert, that the doctrine concerning the fluids is still the most imperfect part of our physiology. Every thing systematical that has been delivered upon it, till within these last forty years, may be totally disregarded: for it is only within the period now mentioned, that we have acquired any distinct notions of a fundamental doctrine; or, in other words, of the state of aggregation in the mass of blood. Even with respect to this last, there still remains much doubt and obscurity; but notwithstanding these difficulties, I shall endeavour to consider what may be said with regard to the state of the fluids in different persons.

It may now safely be held, that the mass of blood, or that portion of our fluids which fills and flows in the red vessels, and from which all the others seem to be derived, is every where a

heterogeneous aggregate, consisting chiefly and especially of three parts; to wit, red globules, gluten, and serosity: And if it should be alleged that there are other matters present, as perhaps there may be, I shall in the sequel examine the question; but in the mean while, I believe they may be considered as portions of the three principal parts now mentioned.

With respect to these principal parts, it is sufficiently probable that they are in a different proportion in different persons: and this different proportion may therefore have a share in giving some difference of temperament; although in what cases this takes place is not easily to be ascertained.

That the red globules may be in different proportions to the whole mass, we discern very clearly from several diseases, in which their quantity is evidently and considerably diminished; but what may be their proportion in persons in health, or in what manner that proportion is connected with the other circumstances of health, is by no means ascertained by any proper experiments. From several observations on animals whose vessels are easily subjected to microscopical examination, it appears that the proportion of red globules is greater or lesser, according to the greater or lesser quantity of the aliment or nourishment the animal receives. It is very possible, therefore, that the quantity of them in the human blood may be affected by the same circumstances: But still this does not aid us in determining the question with respect to persons in health, who take in nourishment in proportion to their several bulks; and whether the effect of nourishment be determined by the quality, as well as by the quantity, is not ascertained. It appears to me, that, if at all, it is not affected much by the quality of nourishment, unless the difference of that quality be very considerable. It appears also, that the proportion of red globules is as great in the animals living entirely upon vegetable aliment, as it is in those who live entirely upon animal food, or as it is in man, who lives partly upon the one and partly upon the other.

Many attempts have been made to estimate the proportion of the quantity of the crassamentum to that of the serum in the extravasated human blood; but hardly any of the experiments yet made afford a certain conclusion. The apparent proportion of the two masses is very fallacious; being very much varied by the circumstances which determine the concretion of the cruor to take place sooner or later, and by the time which is allowed to pass from the time of concretion to that at which the proportions are examined. It is now indeed well known, that these circumstances

vary the separation which takes place; and it does not appear to me, that in any of the estimates which have been made, due attention has been given to the effect of those circumstances. When Dr Haller, in his Primæ Lineæ, paragraph 138, gives this judgment; "In massa sanguinea media pars, et ultra, cruoris est. In robore valido serum minuitur ad tertiam partem, in febre ad quartam et quintam reducitur, in morbis a debilitate increscit;" I am persuaded that he had judged entirely from the quantities that appear separated in ordinary blood-lettings, and had not attended to the different quantities that appear in these, according to the different circumstances of the blood-letting. In cases of rheumatism, I have seen the crassamentum not equal to a third part of the serum surrounding it; and other cases, where the serum did not separate from the crassamentum, to the amount of a fourth part of the whole mass: and from attending to the circumstances of the blood-letting, I have been able to foretel what, in twenty-four hours after, would be the condition of the separation. But even supposing we had a more exact estimate of the serum with respect to the crassamentum, or in other words, of the red globules and gluten taken together, it still remains undetermined what proportion these two last mentioned matters bear to one another; and consequently it is not yet ascertained what is the usual proportion of red globules in the blood of persons in health, nor how far it may have a share in producing a peculiar temperament.

With respect to the gluten of the blood, considered by itself, it is equally difficult to ascertain its proportion either to the whole mass or to the several parts of it. It seems to me to be determined, that the gluten, whether combined with the red globules in the crassamentum, or spontaneously separated from the other parts, is the same kind of matter with that which is dissolved in the serum. In what proportion, however, this last may be, is by no means accurately determined. There is reason to believe that the serum is always a saturated solution; but at the same time it is probable, that the solvent power of the serosity may be greater or less upon different occasions; and therefore we still want experiments to ascertain the proportion of the whole of the gluten to the rest of the mass. It may readily be admitted, that in healthful bodies, both the red globules and the gluten may be more or less, according to the quantity, and in some measure according to the quality, of the aliments taken in during a given time: but this will hardly enable us to determine what is the proportion in the healthful bodies of different persons; and consequently what share

they may have in giving a difference of temperament. It may be presumed, however, that with respect to the serosity, the proportion of red globules and of gluten taken together, will be greater or less according to the force of the digestive and assimilating powers in each person; and that these again will be according to the general strength or weakness of the system. The proportion of the several parts of the fluids, therefore, may be different in different temperaments; but still this will not of itself produce that difference.

It remains to consider the third portion of our mass of blood; and that is, the serosity; with regard to which, the ascertaining its proportional quantity is equally difficult. It must be equally so with respect to the ascertaining the proportions of the crassamentum and the serum; because the proportion of serosity may be presumed to be the same with that of the serum: and therefore, till the latter can be more exactly ascertained than it has yet been, we must endeavour to do it by considering those causes which may be supposed to produce in greater or lesser quantity the matter contained in the serosity.

In attempting this, we shall lay aside a consideration that might readily present itself, and which is, that of the quantity of liquid taken into the body. This certainly does occasionally increase the quantity of serosity: but as I believe the excretions in healthful bodies are always increased according to the quantity of liquid matter present in the blood-vessels; so I suppose that a greater quantity of liquid occasionally taken in, will soon pass off by the excretions, and therefore will occasion no steady difference in the proportion of serosity in the healthful state of different persons.

We must therefore seek for some other cause of the difference in the proportion of serosity. With this view, it appears, that the digestive and assimilating powers of the animal œconomy are fitted to prepare, from the aliments taken in, a fluid suited to the purposes of that œconomy, particularly to the nourishment of the solid parts of the body; and such fluid, whilst in a condition fit for its purpose, we presume to be bland, mild and nowise noxious and hurtful.

At the same time, it is probable that these same fluids are not long stationary in that condition; but in consequence of a certain process constantly going on, are changed into such a state, that if the change was to go too far, and the changed fluids at the same time to be retained in the body, they might prove to it extremely noxious, and even pernicious. It is the change now mentioned that

we suppose to produce the serosity, which, although suited to some purposes of the œconomy, is yet at the same time necessary to be constantly thrown out of it; and is therefore what affords the ordinary excretions. From this last circumstance of the serosity being fitted in proportion to its quantity to be thrown out by the excretions, we presume that its proportion in the whole mass is seldom for any length of time to any degree of excess. Still, however, its proportion may be different in different persons; and this difference may have a share in giving a difference of temperament. It may be alleged, indeed, that the animal process which produces a serosity may be in different degrees of force in different persons; and conquently, that the serosity may be produced more or less quickly, as well as be of a more saline quality, in one person than in another: so that in this manner, by a difference in the quantity and in the quality of the serosity, a difference of temperament may be produced. That this is possible, cannot be denied; but I do not know the circumstances in which it takes place, nor the external appearances whereby it may be discovered.

It has indeed been commonly enough supposed, that the blood is in a more saline state in some persons than in others; and this may be the case, but we have no proper experiments to ascertain the quantity or condition of the saline matter in the blood. It has been imagined, that the saline state of the serosity may be discovered by certain appearances on the surface of the body: but with respect to these, the conclusion is fallacious; because it can be rendered probable, that these appearances often depend more upon the state of the skin itself, than upon the state of the fluids passing through it.

Upon the whole of this inquiry into the state of the blood, with respect to its aggregation, or with respect to the state and proportion of the several parts which compose it as an aggregate, it seems not only to be uncertain how far these circumstances give a difference of temperament; but, on the contrary, it seems probable, that they never do so in any considerable degree.

Notwithstanding all this, ever since chemical reasonings have been admitted into our physiology, that is, ever since the time of Paracelsus, physicians have considered our fluids as distinguished by the state of their chemical mixture, either in the whole of the mass of blood, or in the several parts which compose it as an heterogeneous aggregate. It is, however, in the latter view only, that is, with respect to the several parts, that we can chemically consider the subject; and here it will be readily acknowledged, that till

very lately, much frivolous, hypothetical and false reasoning has prevailed in the chemical doctrines respecting the nature and state of our fluids. Even at present, physicians have hardly come to be sufficiently chaste in avoiding such hypothetical doctrines; and however confident they have been in their chemical reasonings, I am unable to find any thing either clear or certain upon the subject. Not to mention how little we have yet learned of the nature of vegetable or animal substances from their chemical analysis, it is enough to say here, that with respect to some parts of the mass of blood, it is by no means ascertained, either that their chemical mixture is upon different occasions anywise changed, or what change is produced, or in what manner such change is effected. This may be very confidently asserted with respect to the red globules; the mechanical or chemical properties of which are neither of them clearly ascertained; and we neither know how they are formed or produced, nor in what manner they may be chemically changed.

With respect to the gluten, I am disposed to make the like assertion: for it appears to me, that we neither know how it is formed from our vegetable aliment, nor what is precisely the state of its mixture; and therefore we cannot clearly say *à priori*, how it may be chemically changed. I do not indeed know of any observations which ascertain its being in any case changed in its sensible qualities. There are indeed cases in which its viscidity and force of cohesion seem to be considerably diminished; but different explanations of these phenomena may be offered: and however they may be explained, the phenomena seem to take place only in more evidently morbid cases: so that we have no just grounds for asserting that any such difference takes place in the temperaments of different men in health. It has indeed been commonly supposed, that the density and viscidity of the mass of blood is different in different persons, even in a state of health, and more certainly in the case of disease; and this has been imputed either to the greater proportion of gluten in the mass, or to the greater viscidity or force of cohesion of the gluten that is in due proportion present: but neither the one nor the other supposition has been ascertained by proper experiments. Some experiments, indeed, as those of Dr Browne Langrish, have been offered for the purpose; but they are evidently frivolous and fallacious.

I have said above, that the proportion of gluten in the blood may be increased by the quantity of aliments taken in, and by the vigour of the system in preparing and assimilating these: but it is sufficiently probable, that the proportion of gluten will be suited

to the vigour of the system, and therefore produce no morbid state; and although it should have some share in giving a difference of temperament, it will not do this as considered by itself, but only as accompanying the other circumstances of more power in the system.

I cannot dismiss this subject without observing, that the supposition of a preternatural spissitude of the mass of blood, or as it may be expressed of a lentor, being a frequent cause of disease, has had a great share in almost all the modern systems of pathology; but I allege that it has been for the most part hypothetical; and has hardly, so far as I know, in any case been ascertained as a fact. I am disposed to maintain, that the supposition is for the most part improbable. The functions of the œconomy, depending upon the constant motion of fluids through many narrow canals, require that those fluids should have a very great fluidity; and accordingly Nature has, for this purpose, provided, that a pure water should always make a very great part of the animal fluids. It is also certain, that those parts whose particles might be disposed to unite together, and to form impermeable masses, are for the most part held in a state of solution, and in a very fluid state; or if there are certain parts which are only in a diffused state, these are in very small proportion to the entirely fluid parts: and while the heat and motion of the whole continue, the cohesive matters are kept in a very minutely divided state, and diffused amongst the more fluid parts; and there is not any evidence of their separation from those fluids but in consequence of stagnation. There is therefore little foundation for the supposition of a preternatural spissitude prevailing in the mass of blood, or of its proving commonly the cause of disease: And although what I have now said be not suited directly to my present purpose of explaining the difference of temperament, yet it has some concern in it; and in an introduction to the consideration of the operation of medicines, cannot be improper.

But to return to my subject: I have now endeavoured to show, with respect to the red globules or gluten, that from the consideration of their chemical mixture, we can obtain very little knowledge towards the distinction of temperaments. It may, however, be expected, that by means of chemistry we may obtain more from the consideration of the serosity; but how far we can go even in this matter, is to me still very uncertain. It is now known very well that the serosity of the human blood is a watery fluid, which holds dissolved in it, besides a quantity of gluten, a peculiar salt which is hardly known, or at least is not distinctly perceived to be in any

other part of nature besides that of animal bodies. We know also, from the excretions which we presume to be afforded by the serosity, that there exists in it also a quantity of oily matter: but of what particular nature that is, or in what proportion it is present, or in what manner it is combined with the other parts, we do not know with any precision; and therefore cannot say in what measure the consideration of this oily part may serve to ascertain the different state of the fluids in the different bodies of men in health.

We may, I think, neglect the consideration of the oily part of the blood; but the saline part may seem to deserve more attention. There is ground to believe, that beside the peculiar saline matter above mentioned, there are a number of other saline matters present in the serosity; but of what nature precisely, or in what proportion, remains unknown. To give an example of this, we know now that there is in the urine of every person, probably derived from the serosity, an acid, that upon certain occasions gives a concretion in the urinary passages, and which, separated from the urine, puts on the appearance of an earthy or stony matter. This, however, has been learned only lately from the analysis of such urinary concretions as have become a disease; and the discovery, while it now enables us to correct some parts of our system, serves at the same time to show how ignorant we were with regard to the state of the human fluids.

From these considerations of the several matters which we can perceive to exist in the mass of blood, it will appear that there is little ground for distinguishing the different temperaments of men by the different state of their mass of blood. It is indeed very possible that a different state in this respect may take place in different men; but to what degree, or by what external marks it may be perceived, in ascertaining either the one or the other, physicians have hardly yet gone any length.

Without entering thus into the considerations of the different states of the serosity, it may be imagined there is a grosser view, that may be taken for distinguishing the different state of the fluids in different persons.

There is in the human body, as living always in part upon vegetable aliments, a power whereby these aliments, after being some time in the body, are considerably changed in their nature and qualities, being changed into animal fluids; which are in several respects considerably different from the vegetable matters that were taken in. How this change is effected we do not exactly know; and the only circumstance that tends somewhat towards the illus-

tration of it, is, that a change of vegetable matter, nearly analogous to this which happens in the human body, is made by its being subjected to putrefaction: and though we cannot distinctly perceive in what portions of the fluid, more especially in what manner, or to what degree, this is carried on in the body, we may pretty safely conclude in general, that the animal process is a part of the putrefactive fermentation. At the same time we observe, that after the animal process has brought the aliments into that state which is suited to the purposes of the animal œconomy, or into the proper state of animal fluids, these are not long stationary in that condition, but are constantly advancing towards a putrid state; and that these degenerating and degenerated parts are what chiefly form the saline or earthy ingredients of the serosity, which, with a part of the fluid, are constantly passing out of the body by the several excretions.

In this view, we can perceive that the animal fluid may in its composition be more or less prone and more or less advanced towards the putrescent state; and that by these circumstances the fluids may be different in the consistence of the whole mass, or in the chemical qualities of the serosity: but till the changes in these respects have proceeded to a morbid state, we can hardly perceive them when in a lesser degree, or say how far they can, or actually have, a share in distinguishing the temperaments of men in health.

From the several remarks we have now offered respecting the serosity, it clearly enough appears, that there is a portion of the mass of blood which is always in a saline and acrid state; and nothing has been more common among physicians, than to suppose that an acrimony of the fluids is a frequent cause of disease.

It is very possible that it may be so, and upon many occasions it certainly is so; but it appears to me that the supposition has been too rashly and too frequently admitted, and that it has been for the most part purely gratuitous, without any proper evidence of it in fact. The possible species of acrimony have been little understood, and several of them altogether erroneously supposed. Others of them, though possibly occurring, have not been shown really to take place in any unusual quantity; and the phenomena adduced in proof of them may be commonly explained from other causes, and are certainly often produced by causes of a different and even contrary nature.

With respect to the various acrimony which we have allowed to be constantly present in the serosity, it is probable, that upon dif-

ferent occasions it may be in greater or lesser quantity; but for this very reason of its being constantly present, we must conclude that it does not stimulate the system very strongly. This happens partly from these acrids being constantly diffused in other mild fluids, partly from the arterial system not being sensible to such a stimulus, and partly from these acrids stimulating the secretory and excretory organs to a larger excretion, whereby they are by one or other excretion immediately thrown out of the body. From these considerations, I conclude, that a spontaneous and noxious acrimony does not frequently arise; for the greatest part of mankind pass their lives without feeling any of the effects that might be imputed to it; and though there are some instances of its operation, these are very rare, and commonly in consequence of unusual and violent circumstances in which the body has been placed.

With respect to acrid matters introduced into the body from without, there is no doubt that many of these are sufficiently powerful in disordering the system; but there are certainly also many thrown in that have no effect at all: for not to mention the various precautions which nature has taken to prevent their reaching the mass of blood, I think it is only necessary to observe, that even when in the mass of blood, they are rendered innocent, by their being joined with, and diffused in, the serosity, and with it soon thrown out by one or other of the excretions; so that some of the most acrid, as mercury and cantharides, show their effects only in the secretory or excretory organs.

Upon the whole of this subject, therefore, I would conclude, that the supposition of an acrimony as the cause of diseases, has been too frequently admitted in our modern pathology; and that it ought not to be admitted, unless when the causes and existence of it are well ascertained.

To conclude, I will not deny that the state of the fluids, may have a share in distinguishing the different states of the body, both in health and in sickness: but at the same time I must maintain, that we know little of the manner in which it may have this effect; that our theory of the human fluids is still very incomplete and imperfect; that while in this condition it has been employed too rashly and too largely in every part of the system of physic; and that we have little temptation to do this, as it is highly probable that the state of the fluids depends very much upon other circumstances of the constitution, which are more fundamental, and more powerful in determining the several conditions of it.

ARTICLE III. *Of the Distribution of the Fluids.*

THE third circumstance by which we suppose the temperaments of men may be distinguished, is the different state of the distribution of the fluids, and also the different state of the balance in this respect between the several parts of the system.

It is in the first place, evident, that it is chiefly by the action of the heart the blood is propelled into the several vessels of the body; for although the action of the arteries contributes to promote the motion of the blood, and although upon certain occasions the action of the arteries in particular parts may be increased or diminished, so that the momentum of the blood in particular parts is promoted or abated without any change in the action of the heart; yet it is presumed, that in the ordinary state of men in health, the action of the arteries is exactly in proportion to the action of the heart in distending them; and therefore that we may hold the action of the arteries as given, and consider the heart alone as the moving power.

The action of the heart, therefore, taking place, the distribution of the blood into the several parts of the body will be in proportion to the capacity of the vessels, and in proportion to their density or resistance in the several parts. Of this we have a clear example in the gradual formation of the body, from its first beginning to its full growth; during which the parts are successively evolved, some of them attaining sooner than others their full growth, owing, as it appears to me, to the different state of the capacity and resistance of the vessels at the different periods of life; which, again, is probably determined by the state of the original stamina.

This makes a considerable difference in the state of man at different ages, during the gradual growth of the body; and it appears more especially with respect to the head, which, for several purposes of the animal œconomy, is first evolved, and comes first to its full size. This certainly happens from the vessels of the head being, in respect of capacity and density, suited to that end; and consequently, in the first part of life, the blood is determined in a proportionally greater quantity into the vessels of the head than into other parts of the system: and it is sufficiently probable, that this proportion is greater as the animal is nearer to its origin, and continues greater till the body attains its full growth; after which, however, it continually decreases, as the animal advances to that period when it may be supposed to cease.

When the body has arrived at its full growth, we very generally

find a symmetry and exact proportion established in the size and bulk of the several parts which fall under our observation; and we may then suppose the distribution of the blood to be suited exactly to that proportion. This indeed takes place with great uniformity in the most part of men: but I still deem it possible, that a disproportioned capacity in certain parts may occur in certain men, and subsist in them through the whole of life. Accordingly, it has been commonly observed, that men of large heads, and large in proportion to the length of their bodies, are more liable to a plethoric state in the vessels of the head, and to the diseases depending upon it. I have also remarked in several instances, that men having their feet and hands shorter than in the usual proportion to the rest of the body, were more liable to a plethoric state of the lungs.

This leads me to observe, that of the proportions of the capacities of the several parts of the body influencing the distribution of the blood, one of the most considerable is, the difference of the capacities of the vessels of the lungs, and of those of the system of the aorta. It is especially discovered by the size of the thorax with respect to the other parts of the body; and this may be considered as occasioning a considerable difference in the constitutions of men. What effects it has in disposing to certain diseases, is well known to physicians.

Upon this subject of the distribution of the blood, it is particularly to be taken notice of, that there is a certain balance between the force of the heart, and the resistance of the extreme vessels by which the perspiration is thrown out. It is probable, that upon this, the state of that excretion in different persons very much depends; and which perhaps may be illustrated by this, that the resistance of the extreme vessels seems, in some cases, to be so great as to diminish the perspiration, and in consequence the appetite. Accordingly, the circumstance of men of considerable bulk, and tolerably full habit, having less appetite, and taking in less food, than others of the same bulk usually do, in my opinion may be ascribed to the weakness of the heart with respect to the extreme vessels: and, on the other hand, we find men of a moderate size, and of a lean habit, take in very largely of food; which I think must be imputed to the force of the heart being in them, great, with respect to the resistance of the extreme vessels.

With regard to the balance between the heart and extreme vessels, we cannot fail to remark, that although the interruption or diminution of perspiration is often owing to cold constricting the vessels, and increasing their resistance to the action of the heart,

yet it is at the same time evident, that it frequently may be owing to the weakness of the heart not pushing the blood with due force towards the surface of the body, that this last is rendered more liable to be affected by cold. This disposition to be affected by cold may take place not only occasionally, as it may in most persons, but seemingly it subsists in some through a great part of life, and therefore may be considered as distinguishing the different conditions and temperaments of men.

Of all the differences occurring with respect to the distribution of the blood, there is none more remarkable than that of the proportion of the quantity in the arteries and veins. It is now ascertained, that this is different at different periods of life, from the difference occurring in certain circumstances of the arteries and veins at those different periods: for it is now known, that the coats of the veins have a greater proportional density in young animals than in old; and therefore the resistance being greater in the veins at the one period than the other, less blood will be received into the veins, and more will be retained in the arteries. This difference of the quantities of blood in the arteries and veins manifestly occurs in the ordinary progress of life: but it is also probable, that in some persons the same difference, to a certain degree, takes place through the whole course of life, and gives a constant and considerable difference in the temperaments of men, as I shall mention more fully hereafter.

Article IV. *Of the different Proportion of Solid and Fluid in the Body.*

A fourth circumstance producing a difference of temperament, is the different proportion of solid and fluid in different persons. That this proportion varies at different periods of life; that in young persons the solids are less dense, and the number of vessels is greater; and that consequently the proportion of fluid to solid is greater in young persons than in old, there can be no doubt: while, on the other hand, the quantity of solid is constantly increasing, and the number of vessels diminishing through the further course of life; so that these circumstances in old age are all of them entirely reversed. These conditions, therefore, are ever varying in the progress of life, and at the different periods of it, may be supposed to be suited to the œconomy: but, at the same time, there are circumstances which vary this matter independent of age.

In the first place, as we have already remarked, that the density of the simple solid is determined by the state of the original sta-

mina, so the conditions of the system by which the change we have mentioned is produced, may be supposed in some measure to be determined by the same circumstance. In consequence of this, the solids throughout the whole of life may be more dense in proportion to the size of the vessels; so that the proportion of fluid to solid, may be different in different persons of the same age, and in this respect, throughout the whole of life give a difference in the temperaments of men.

In examining this subject, it is necessary not only to take into view the quantity of solid and fluid compared together on the whole, but to consider also the manner in which they are applied to one another. As the solids are formed into hollow tubes or vessels, through which the fluids are in constant motion, we must consider to what degree the vessels are filled by the fluids moving through them.

In this view, it is evident that by the blood moving more slowly as it recedes farther from the heart, the vessels containing the red blood are constantly stretched or distended in every dimension beyond the size they would assume if no stretching power was applied to them; and this is what may be called a plethoric state of the system. Such a state is necessary not only to the evolution of the system, and consequently during the growth of the body, but throughout the whole of life it is requisite to the action of the vessels and to the due tension and action of perhaps every fibre of the system. This, however, may be different in different persons at the same period of life; so that the vessels may be stretched more or less beyond their natural capacities. In infancy, the solids are lax and yielding, and the vessels can bear to be stretched more than they commonly are: but as from that period the density and resistance of the solids are perpetually increasing, so the tension of the arterial system is constantly approaching more and more to what it is able to bear, till at length the force of the heart can no longer extend the arteries at all, and a greater quantity of blood is thrown into the veins. In this condition matters remain through the rest of life; but at the same time both kinds of vessels remain in a plethoric state.

From this view of the subject, it will appear that the human body, for the purposes of health and the proper exercise of its functions, is constantly in a plethoric state; but it is still supposed, that upon occasions it may be more or less so, and may be to such an excess as to produce either a disease, or at least a strong tendency to disease. Indeed it is possible, that throughout the whole

of life, the quantity of blood, and consequently the fullness and tension of the vessels, may in some persons be in a greater proportion than in others, and thereby have a share in distinguishing the temperaments of different men.

This last supposition has been universally admitted, and probably is well founded, although I find it difficult to determine certainly when it does really take place. It may perhaps in general be determined by the fulness of the pulse, the apparent size of the vessels on the surface of the body, the ruddiness of the complexion, and the general succulency of the habit. With respect, however, to the latter circumstance, we are apt to be deceived by our not being able, in many cases, to discern whether the plumpness of the body is owing to the fulness of the blood-vessels, or to the quantity of oil in the adipose membrane. The causes of both are very much the same; and it is only when the fulness of the habit takes place to a considerable degree, that we can with any certainty ascribe it to obesity, rather than to plethora or a fulness of the blood-vessels.

This necessarily leads me to take notice of the different state of the adipose membrane, as giving a considerable difference in the constitutions of men. The different states of the adipose membrane are for the most part abundantly obvious; and the effects of obesity are often sufficiently observable: but upon what internal state of the body, or upon what modification of the œconomy, it always depends, is not easily to be ascertained. It may be supposed in general to depend upon the quantity of nourishment, and in particular upon the oily quality of the aliment taken into the body; but although it certainly does often, *cæteris paribus*, depend upon these, yet at the same time we are certain it does not always depend upon these alone, and that in producing it many other circumstances may concur.

It seems to me very possible, that the aliment being given, the digestive and assimilating powers may often produce fluids more or less disposed to admit of a more or less ready separation of oil, and consequently of its secession into the adipose membrane; or that, on the contrary, the same powers may produce fluids in a more saline state, and in which the oily parts are mixed in such a manner as to render them more ready to pass off by the excretions. It is well known, that an active circulation which powerfully supports the excretions, is also powerful in preventing the accumulation of oil in the adipose membrane, and that this indeed happens in many persons without any assistance of bodily exercise; but we

know also, that this accumulation of oil is especially prevented in those who take a great deal of such exercise; because this not only supports and promotes the excretions, but gives occasion likewise to the constant absorption of the oil which had been before deposited in the adipose membrane.

Whether a condition in the mass of blood disposing it to produce a copious serosity, may not be a means of increasing the absorption of oil for the purpose of involving an increased acrimony, I cannot positively determine; but this seems to be very probable, because we find emaciation to be the consequence of a morbid acrimony prevailing in the fluids, as is evident in the cases of scurvy, syphilis, and cancer.

To all these causes increasing or diminishing the fulness of oil in the adipose membrane, and which, in the cases of obesity or leanness, may allow us in general to judge of the state of the system, and in particular of the state of the fluids, we must add a consideration which relates to the function of particular parts. The secretion of oil does not seem to me to be yet clearly explained: but in general it may be supposed to depend upon a peculiar organization in the secretory organ, or in the cellular texture receiving it; because it manifestly takes place in some parts of the body more than in others. For example, it takes place in the omentum more than in the mesentery; and it is often found in preternatural quantity, or in greater proportion, in certain parts than in others: so that we must suppose it to be occasioned by some peculiar circumstances of those parts; and may therefore presume, that in the organs concerned in this business over the whole body, there is a peculiar constitution which, independent of all the others we have mentioned, has a great share in giving that state of obesity or of leanness which often marks a difference in the temperaments of men. At the same time, the cause of this is not yet well explained.

Before concluding this subject, it may be proper to observe, that although a plethora or the fulness of the blood-vessels, and obesity or fulness of the adipose membrane, are very different circumstances, yet it is probable, that the fulness of the adipose membrane does always compress and diminish the size of the blood-vessels, and gives a plethora *ad spatium*, which has often the effects of the plethora *ad volumen:* and I have frequently remarked, that while persons of a fat habit may require evacuations of blood, yet at the same time they bear them worse than persons of a lean habit do.

Article V. *Of the State of the Nervous Power.*

A fifth circumstance that may serve to distinguish the different temperaments of men, is the different state of the nervous power. As we have already said, that the motions of the human body very generally begin in the motions of this power, and that the motions which commonly follow it, depend upon the existence and state of the same power in the other parts of the system; so this power may be considered as the prime mover in the animal œconomy; and therefore the different states of it must unquestionably have a chief share in distinguishing the temperaments of different men.

Its effects, however, in this respect, have, till very lately, been very little taken notice of. The general doctrine of the temperaments, as depending upon the state of the moving powers, has indeed been delivered by several writers; but there are none of them who have prosecuted their inquiries so far as to ascertain those different states of the moving powers which may especially produce the difference of temperaments. I shall now attempt this subject; but, fully aware of the difficulties that attend it, I shall suggest what I have to offer with a great deal of diffidence.

The different states of the nervous system may, I think, be referred to three heads; according to the different state of its Sensibility, its Irritability, and its Strength.

As the motions of the nervous system are most commonly excited by bodies acting upon the sentient parts; so I shall begin with considering the sensibility of the system.

OF SENSIBILITY.

We have before defined sensibility to be that condition of the living body, whereby it is capable of being affected in a peculiar manner by the impulse of other bodies on certain parts of its nervous system; and which are therefore properly named its Sentient parts.

The extent of these sentient parts, although perhaps it may not be yet entirely, is, however, pretty fully, ascertained; and that in general the sentient parts are the nerves, and every part into the composition of which nerves enter, so as to be exposed to the impulse of other bodies. We are not, however, concerned here in any dispute upon this subject; having to consider only the degree of sensibility that may be in common to the whole of the sentient parts, and how far that may be constantly different in different persons.

In considering this, we can perceive pretty clearly that the sensibility of persons is different at the different periods of life; and that it may be occasionally varied by the temperature of heat and cold applied, by the application of stimulant or narcotic powers, by the state of sleep and watching, and by some other conditions of the body. All these causes occasionally changing the state of sensibility, may deserve much attention in pathology; but I omit them here, and inquire only after those permanent states that may give a different degree of sensibility to different men at the same period of life, and modify the operation of occasional causes throughout the whole of it.

In this inquiry, I shall consider sensibility as it may depend either upon the state of the sentient extremities, or upon the state of the sensorium.

With respect to the first: In so far as these extremities are the organs of peculiar sense, their sensibility may appear different according to the different state of the organ conveying and transmitting the impulses of external bodies to the proper sentient medullary extremities; and in this way the sensibility of different organs may be very different in the same person: but these differences we at present neglect, and inquire only into the different states of sensibility in the proper sentient medullary extremities, which may be in common to the whole of the sentient parts of the same person, but may be different in different men.

This difference may, I think, depend either upon the different mobility of the nervous power, or upon the different degree of tension in the nervous extremities.

I here presume with some confidence, that the motions occurring in the nervous system are the motions of a subtile elastic fluid somehow connected with their medullary substance; and I suppose that this fluid may have its density and elasticity in a certain proportion to one another, but this varying in different persons, and in the same person at different periods of life. From hence it will follow, that as the elasticity is greater with respect to the density, the mobility of the fluid will be greater, and the body in which it takes place will have a greater degree of sensibility; and, on the contrary, that a lesser sensibility will result from a greater density with respect to the elasticity.

That such a difference in the proportions of elasticity and density does actually take place, may be readily concluded from what happens in the course of life, where we can distinctly perceive that the sensibility is gradually diminishing as the density of the sim-

ple solid is increasing: and if, as we have said above, the original stamina give a different state of the density of the simple solid in different persons, and that proportionally through the whole of life, we shall have no difficulty in supposing that the same circumstance will give a difference in the proportional density and elasticity of the nervous fluid, and therefore a difference of its sensibility. It is much in illustration of all this, that the sensibility is evidently less, according as the strength of the system following the density of the simple solid is greater in different persons, as well as at the different periods of life.

The difference of sensibility may therefore depend upon the different condition of the nervous fluid inherent in the medullary substance: and that it is liable to be in such different conditions, we learn from the different causes of the difference of sensibility mentioned above; some of which, such as narcotic powers, or heat and cold, affect the sensibility of the nerves, even when entirely removed from all connection with the other parts of the system.

A second circumstance determining the state of sensibility, seems to be the degree of tension that is given to the extremities of the medullary fibres in all the several organs of sense. To explain this, I suppose that the motion of the nervous fluid is an oscillatory motion in an elastic fluid, and that the most part of impressions made upon the organs of sense are made by the impulses of the oscillatory motions of other elastic fluids; and if all this be just, it will be evident that the motions excited in the nerves by impulses upon their extremities, will be more or less considerable according as these extremities are under a greater or lesser degree of tension. For giving this necessary tension, nature seems to have provided, by distributing a very copious ramification of blood-vessels among the medullary fibres that are properly the sensorium in every organ of sense. It is nowhere more remarkable than in the retina of the eye; and that the tension of the blood-vessels must give a tension to the medullary fibres thus intermixed and coherent with them, is sufficiently probable. That the increased tension of the blood-vessels has an effect in increasing the sensibility of the eye, is well known from many cases of opthalmia, or, as I may otherwise express it, in the cases of afflux of blood into the vessels of the eye; in which the sensibility of the retina is increased to a prodigious degree. The increased sensibility both of the eye and ear that commonly attends phrenitis, is readily explained in the same manner; and some other illustrations might be given to the same purpose.

I had a case in which the feeling of a hand was lost: and it was afterwards clearly perceived, that the loss of feeling was owing to a palsy of the brachial artery, whose pulsations gradually ceased from the wrist to the arm-pit; whence I judged, that the loss of feeling was to be imputed to the want of blood and tension in the papillæ of the skin, into each of which we know a branch of an artery enters.

It will appear, therefore, that the sensibility of the extremities of the nerves depends in some measure on the degree of tension given to them by the blood-vessels constantly intermixed with them: and as we have said, that the constitutions of men are different by the difference of their plethoric state; so the difference of their sensibility may be merely on this account greater or less.

It has been already observed, that the constitution of the nervous fluid corresponds in some measure with the other marks of strength or weakness in the system; and this I suppose to take place in every person through the whole of life, and therefore to afford a proof of its depending on the state of density in the nervous fluid.

Before dismissing the subject, I think it necessary to explain a case of occasionally increased sensibility that may occur in any person or at any period of life. It is the increase of sensibility on occasion of any unusual increase of debility. In order to account for this, we suppose the whole of the nerves, or the whole of the medullary substance of the nervous system, to be every where pervaded with the subtile elastic fluid above mentioned; and that this elastic fluid will always bring its several parts to a balance with one another, so as to become of the same density in every part. At the same time it is highly probable, that in the brain, as being the principal seat of this system, and to which all the other parts are in some measure united, there is a common centre of motion and power; from whence, in consequence of certain circumstances, the nervous fluid is determined with greater force, and perhaps in larger quantity, into some parts than into others. This is what I would term the Action or Energy of the Brain; and it is particularly evident in the operations of the nervous power in the case of voluntary motions. It is most probably a certain degree of this energy which constantly supports the fulness in every part of the nervous system; and it is also pretty plainly this which supports the inherent power in the moving fibres. Indeed it is equally probable, that the same energy supports the fulness and density of the nervous fluid in the sentient extremities. And from all this, it

appears to me that we may readily understand why the weakened energy of the brain, as not supporting the usual density in the sentient extremities, should produce a greater degree of mobility, and consequently of sensibility.

It is in this manner I would endeavour to account for the increased sensibility accompanying so many cases of debility: but it is to be observed, that in certain cases this weakening of the density of the nervous fluid in the sentient extremities may go to excess, and destroy sensibility and sense altogether.

This doctrine of the energy of the brain being, in a state of health, constantly extended every where to the sentient as well as to the moving extremities of the nerves, may be illustrated from remarking, that when, upon any occasion, the energy of the brain is gradually failing, the effects of this every where appear from the loss of sense and motion, happening first in the parts most distant from the brain, while they are found to subsist longer in these parts which are nearer to it.

We have thus considered the state of sensibility as depending upon the state of the sentient extremities: but I have mentioned that it may also depend upon the state of the sensorium commune; and which, therefore, now requires our attention.

Before entering particularly upon this, it may be stated as a question, Whether the state of the nervous cords transmitting motions from the extremities to the sensorium, may not affect the sensibility of the system? And on this subject it might be supposed, that the state of the membranes inveloping the nervous fibres in their course, as well as the state of the cellular texture and blood-vessels laid in these invelopements, and seemingly every where interposed between the several nervous cords, should, according to the different, circumstances of these interposed parts, render the conveyance of the motions of the nervous fluid from the extremities to the sensorium more or less free and forcible. It is indeed sufficiently probable, that the state of these circumstances may have effects in this matter; but we hardly know the cases in which they operate, and still less how far these circumstances are permanently different in different men.

Supposing, however, the motions propagated from the extremities to the sensorium to be quite unaffected in the course of the nerves, our question then must be, How far the effects of these motions in producing a sensation are affected by the state of the sensorium itself? With regard to this question, it may, in the first place be presumed that the constitution of the nervous fluid, with respect

to density and elasticity, will be the same in the sensorium as in the extremities; and therefore, so far as it depends upon this constitution, the sensibility will be of the same degree in the one as in the other. It is likewise equally probable, that a certain degree of tension in the medullary substance of the brain given to it by the fulness of the blood-vessels there, will also have the same effects on sensibility as I have alleged in the case of the extremities.

As, however, the state of tension in the vessels of the brain may, upon certain occasions, be greater than in the sentient extremities of the nerves; so this state of the sensorium may be a cause of greater sensibility, while the force of the motions propagated from the sentient extremities remain the same as before.

Nothing indeed is more evident than that the energy of the brain, that is, its action in determining the nervous power into the rest of the system, depends very much upon the fulness and tension of its blood-vessels; and it is therefore to me probable, that the degree of sensibility in the sensorium will in some measure depend upon the same circumstance. It may perhaps be started as an objection to this, that a certain excess of fulness in the blood-vessels of the brain, seems to have the effect of destroying sense altogether; and that any preternatural fulness might have, in some measure, the effect of impairing the sensibility of the sensorium. The first part of this is indeed true; and I dare not assert that a certain degree of fulness may not render the motions of the nervous power less free, and thereby impair the sensibility of the sensorium: But still this will not destroy the opinion otherwise so well supported, that while the motion of the nervous power remains in a certain measure free, a certain degree of fulness is necessary to the energy of the brain, and therefore that a certain degree of it may increase sensibility.

We have thus found, that sensibility, so far as it depends upon the constitution of the nerves and nervous fluid, will be the same in the sensorium as in the sentient extremities. We have likewise found, that an increase of the sensibility of the system may arise from an increase of tension in the blood-vessels of the brain, as manifestly happens in the case of phrenitis and some other diseases: and there is yet to be mentioned a state of the sensorium, which, in another respect, affects the sensibility of the system.

Every body knows that the most part of sensations arising in the sensorium are accompanied with what is called a Reflex Sensation, that is, a sense of agreeable or disagreeable in the simple sensation; and the circumstances of this have a great share in determining

the effects of the sensation upon the system. This I take to be entirely a function of the sensorium, which, according to its different conditions, is fitted to increase or diminish the state of reflex sensation. That the condition of the sensorium is upon different occasions different in the same person, is sufficiently obvious; and it appears to me no less obvious, that however it may be varied on different occasions, there is a character or tone in these respects runs throughout the whole of life, and is a circumstance very much distinguishing the different temperaments of men. It is indeed difficult to ascertain the condition of the sensorium that disposes it to have agreeable or disagreeable sensations more or less readily, or in different degrees excited in it; but though this cannot be done, yet it is very proper to mention it as modifying the sensibility of the system, and therefore of great influence in the pathology of physic, and in distinguishing the moral characters of men.

Having now treated of the sensibility of the nervous system, I shall proceed, in the next place, to consider its irritability; which may have a great share in distinguishing the temperaments of men.

The general idea of irritability has been already mentioned; and we have likewise observed, that this property belongs only to certain fibres of a peculiar structure and confirmation fitting them for this purpose.

OF IRRITABILITY.

In what I am to offer upon this subject, I abstract entirely from the force with which the contractions of moving fibres may be performed, which by some may be comprehended under the title of Irritability: but at present I consider only the readiness or facility with which the contractions of moving fibres are excited. It is very probable that certain circumstances of this conformation may be so different in different cases, as to give different degrees of irritability; but both of the general structure, and of the varieties of it which may occur in particular cases, I am entirely ignorant.

Our late physiologists have supposed that there is a degree of greater irritability in certain muscles and moving fibres than in others; and particularly, that it is greater in those of the heart, the alimentary canal, and diaphragm, than in those of the other parts of the body. But whether this be owing to any peculiarity in the structure of the fibres in those more irritable parts, or merely to the power of habit, which by repetition seems to give a greater

irritability to every fibre of the system, may be justly a question. It does not appear to me that we have evidence of any peculiar structure in the fibres of the heart, or other supposed more irritable parts; and at the same time, as we know them to be most constantly under the most frequent repetition of their contractions, I am persuaded that their seemingly greater irritability, or rather the persistency of their irritability, is owing entirely to the power of habit.

Presuming, therefore, that we do not know the circumstances of the moving fibres themselves, which might give them in certain cases a greater degree of irritability, we must seek for the causes of this in some general circumstances of the system. On this subject, the most obvious conjecture is, that the irritability of the moving fibres depends upon the same causes with the sensibility of the system. Many observations prove that these two qualities or conditions are commonly in the same degree in many persons; and it is probable that the lesser density of the nervous power, which renders it more moveable in the organs of sense, may also render it such in the organs of motion. It seems to happen accordingly in young persons, in the female sex, and in all persons naturally or occasionally weak.

This leads to the supposition that irritability and sensibility are in the same degree, and depend upon the like causes in every person: and as the contractions of moving fibres produced seem to be commonly in proportion to the irritation applied, which is so often a certain sensation; so it might be supposed that a general irritability being given, the state of it with regard to particular contractions might be neglected, and these contractions be referred entirely to the state of sensibility.

This certainly may be judged to be often the case; but it appears to me that we must not suppose it in all cases; because it seems evident that sensibility and irritability are not always in the same condition in the same person. I conclude this from observing that these two qualities are often under different laws. With respect to sensibility, it is well known that the force of impressions in exciting sensation is by repetition constantly diminished; whereas, by a like repetition of motions, the readiness with which these motions are repeated, or what may be called the irritability of the parts, is as constantly increased. Thus, in certain cases where motions are frequently repeated by the application of the same impression, sometimes the one of the laws mentioned takes place and sometimes the other; so that sometimes to produce a repetition of the same motion, the force of the impression employ-

ed must be constantly increased; and in other cases the motion may be repeated though the force of the impression be constantly diminished. These are cases with which physicians are well acquainted; but in what circumstances the one or the other law takes place, I cannot certainly determine.

However that may be, the whole of these phenomena seem to me to show, that the sensibility and irritability, either in the whole of the system or in particular parts of it, may, on certain occasions be in different conditions; and of what extent this consideration is in the animal œconomy, must be well known to every person who has studied the powers of habit.

Besides these causes of a difference of irritability, another condition may be mentioned in which the irritability is affected by other circumstances than the general state of the nervous system; and therefore may be independent of the state of sensibility in the same person. Although we cannot assign the state of the muscular fibre itself which gives it its peculiar state of irritability; yet in the whole of a muscle, and perhaps in every collection of moving fibres, there seems to be a circumstance which has a considerable effect.

We plainly perceive, that a certain degree of tension in its fibres, is necessary to the proper action of every muscle; or at least it will be readily allowed, that a certain tension is necessary to produce the vigorous action of any of these organs: and physiologists have observed the means employed both by nature and art to give this necessary tension. Besides the extension of muscles in their whole length, which in many cases may be more or less, it appears to be also necessary that every particular portion of their fibres should be kept in some measure in an extended state. This I suppose to be done by means of arteries being every where intermixed with the moving fibres, in such a manner as to lie across the length of these fibres, and thereby necessarily, by their constant fulness and occasional distension, extend to the fibres that pass over them.

The theories which were formerly offered to explain the purpose of nature in intermixing so many blood-vessels with the moving fibres, are now generally exploded; and the only theory which seems to be at present tenable, is, that it is the purpose of nature to give thereby heat and tension to the moving fibres. This provision of nature is necessary upon the footing I have just now endeavoured to point out; and it will at the same time appear probable, that a certain degree of tension will not only give vigour,

but also a greater degree of irritability to muscular fibres; so that the greater or less fulness of the arteries may give a state of irritability independent of the state of sensibility in the system; as seems evidently to take place in all those cases of plethora which we can distinguish from obesity.

Having thus considered irritability as properly residing in the moving fibres or living solids alone, and having considered its various states in these, I judge it necessary now to take a larger view of the subject, and, under the term Irritability, to comprehend the state of those motions, which, beginning in the sensorium, are directed from thence along the nerves to the several moving fibres, and are very generally the beginning of all the motions which take place in the muscular or moving fibres of the body. The degree of facility or readiness, more or less, with which these motions beginning in the sensorium are excited, I would term the Irritability of the Brain or Sensorium; and this we are now to consider farther.

This beginning of motion in the sensorium is most remarkable in those cases in which it is accompanied with, or appears to be excited by, volition. Except, indeed, in those cases, physiologists have commonly considered the brain as an inert and passive organ, having no motions taking place in it, but in proportion to the impulses proceeding from the sentient portions of the nerves, and the sensations arising from thence. I am, however, disposed to believe, that in consequence of the impulses very constantly proceeding from the sentient portions of the nerves, and even independent of any sensation arising at the same time, there is a new power and force of motion excited in the brain, and from thence very constantly directed into every part of the nervous system. This is what I have called the Energy of the Brain; and have alleged, that not only in consequence of sensation and volition, but, without either of these, in consequence of certain other impulses, this energy is manifestly exerted, and excites, with more or less force, the contractions of moving fibres; and farther, that from the impulses very constantly proceeding from the sentient parts, though producing neither sensation or volition, the same energy is excited and exerted so as to support the fulness both of the sentient nerves and of the inherent power of the moving fibres. From all this it will be understood, that under the title of the Irritability of the Brain, I comprehend the greater or lesser degree of readiness with which the energy of the brain is exerted in all its various operations upon the moving fibres.

Having thus explained my idea of the irritability of the brain, I proceed to consider its various states; and, in the first place, in those cases in which the beginning of the motion is either accompanied with, or is produced by, volition; which are always the cases most distinctly observable.

Volition arises in two ways: First, when sensations arising either without, or with very little, reflex sensation, give occasion to the exercise of the judgment in marking their various relations, and their consequent fitness or unfitness for human affairs, they thereby give occasion to various desires, and therefore to volitions for producing those motions of the body that are suited to the ends desired. These volitions may be more or less powerfully excited, according to the operation of the intellectual powers in marking the fitness or unfitness of things: and a different state of these powers, and a quicker or slower perception of relations, certainly distinguishes the temperaments of men. We know little, however, of the physical causes of this; and it is seldom that the difference of the intellectual powers gives such a difference of temperament as may particularly affect the physical state of the human body, and thereby the operations of medicines. We therefore omit the further consideration of the irritability that may take place in the volitions arising from intellectual operations; and this the more especially, because I believe it is never discernible excepting when the intellectual conclusion excites a considerable degree of reflex sensation; and when, therefore, the irritability is in the same condition with that we are now to mention in the second place.

A second case of volition excited, and exciting, is when the sensations, either altogether without, or with very little, intellectual operation attending them, produce these various modes of volition which we distinguish by the names of Appetite, Propensities, and Emotions or Passions. With respect to the two first, we believe that the volition and the motions produced by it are always exactly in proportion to the stimulus applied to the particular parts, from which the propensity or appetite arises; and I cannot clearly perceive that, in modifying this, the irritability of the brain has any share.

It is only in the case of emotions or passions, that is, the modes of desire and aversion of the stronger kinds, that we can suspect a different degree of the irritability of the sensorium to take place. Mankind very generally suppose in different men a different degree of irritability in this respect: and as the whole of the motions here concerned are in the sensorium itself, the irritability must like-

wise be especially there. I entertain indeed no doubt that such an irritability takes place; but so far, however, as I can perceive, such irritability must depend upon the same causes as the sensibility of the sensorium with respect to the production of reflex sensations. To this purpose, we must remark, that in proportion as sensations are agreeable or disagreeable, they must excite desire or aversion in different degrees; and therefore the irritability of the brain in proportion to these; and as it depends upon the same causes, so it must be exactly in proportion to the sensibility in producing reflex sensations. The whole, however, is involved in the same obscurity and difficulty as the peculiar case of the sensibility of the sensorium; so that I shall prosecute the consideration of it no further here; although we cannot altogether quit the subject without taking notice of a curious question that occurs respecting it.

It has been already observed, that sensibility and irritability do in some respects follow different laws, while by repetition, the former is diminished and the latter is increased. We have also said, that there may be a different condition of these two faculties, so that there may be an increase of irritability independent of sensibility; and if this is manifest in particular organs, it may also be supposed to take place in the sensorium. I think it truly does so; and that upon many occasions the irritability of the brain, is independent of its sensibility with respect to reflex sensation.

OF STRENGTH AND WEAKNESS.

Another circumstance of the nervous system meriting attention, as distinguishing the temperaments of men, is the strength of the body, always, in my opinion, depending on the state of the nervous system. The strength of the body appears always to consist in the force of contraction of the muscular or moving fibres. These, in the living body, are constantly possessed of a *vis insita*, or *inherent power*, by which they have a continual tendency to contract and diminish their length; and the force of this power in different persons, may be considered as giving more or less of strength to the system. It may be difficult to say what this depends upon, although probably it depends upon the circumstance of the muscular fibre, so much connected with the other parts of the nervous system, being fitted to receive and retain a large portion of the nervous fluid, which, as an elastic, must have a continual tendency to contract itself, and the fibre in which it is inherent; and the force of this contraction will probably be according to the density of the fluid which gives the inherent power. If I am right in supposing the

state of the simple solid to modify the state of the medullary fibre, this last will contain a denser fluid; as we commonly find the inherent power in the medullary muscular fibre to correspond with the denser state of the simple solid.

This strength of the inherent power, therefore, is one foundation for the strength of the system; but the contraction of muscular fibres does commonly, perhaps always, depend upon a *vis nervea* derived from the brain. This is especially evident in all the cases of voluntary motion; which being always an action of the brain, there seems to be a motion excited there, that is determined with more force, and perhaps in greater quantity, along the nerves into the muscular fibres. In these cases of voluntary motions, the force with which this power is exerted is regulated by the will, and therefore in various degrees, but cannot be exerted with the same degree of force in every different person; and those in which it can be exerted with greater force than in others, are considered as the stronger persons.

Upon this subject it may be fairly concluded, that the strength will always depend upon the force with which the energy of the brain can be exerted; for although that may, according to the will, be in very various degrees of force, it may be supposed that a volition being given, the energy of the brain may be more strongly exerted in one person than in another; and therefore the state of this energy, with the state of the inherent power, will determine the strength of every system: or, as I think it may be shown that the state of the inherent power depends also upon the energy of the brain; so this alone may be considered as determining the strength of every system.

The question, however, upon this arising, is, What gives a stronger energy of the brain in one person than in another? The answer is, that it probably depends upon the state of the medullary fibre containing a nervous fluid of greater density in one person than in another. Indeed it is rendered very probable by this, that in certain diseases of the brain, as in mania, the strength of the system is commonly increased to an uncommon degree; while at the same time we find a great change to have happened in the medullary substance of the brain, by its becoming of a more dense substance than usual.

Having thus explained the cause of strength in general, it is necessary further to explain how, agreeable to these principles, the state of strength comes to differ in a considerable degree at the different periods of life.

That from the beginning of life to a certain period, the strength of the body should be constantly increasing, will be readily explained by the increasing density of the simple solid, and with that the density of the nervous fluid in the medullary fibre.

This, however, has its limited period; for although the density of the solid is still considerable, and even going on to increase, yet the strength of the system does not increase beyond a certain degree; and, on the contrary, is from a certain period constantly declining.

This remains to be explained; and may be attempted in the following manner. We have said that the nervous fluid has the properties of elasticity and density combined in a certain proportion; but that this proportion is constantly varying in the course of life. In the beginning, the elasticity is great in proportion to the density; but while the cause of any increase of elasticity is not known, the increase of density, from what we have said before, is evident and certain; and accordingly with that the strength of the system is constantly increasing. If, however, at a certain period it shall happen, that the density shall be increased to such a degree that it is not moveable by the same impressions on its elasticity as are necessary to excite a strong vibration, the strength of the system can increase no further; and, on the contrary, according as the density is constantly increasing, the force of the energy of the brain must be perpetually diminishing, and with that the strength of the system continually declining.

This is agreeable to the phenomena. In the beginning of life, sensibility depending upon the mobility of the nervous fluid, is considerable; but as life advances, it is constantly diminishing, whilst the strength of the system is still increasing: and after a certain period, while both the elasticity is farther diminished and the density farther increased, the strength that can be exerted must be continually declining.

This perhaps may be illustrated by some other considerations. In the beginning of life, the force of the heart is strong with respect to the system of arteries; and the latter accordingly become stretched out, and the body grows in bulk. This, however, we know, by the increasing density of the arteries, goes on more and more slowly till it stops altogether.

Whilst the force of the heart is constantly filling and distending the arterial system, we may suppose the elasticity of the nervous fluid to be supported in every part of the system; and while the density is at the same time increasing, the strength of the body, by

the tension and fulness of the arteries, will be supported and increased, as we have explained above.

But we have also observed above, that the exertion of the energy of the brain requires the fulness and tension of the vessels of that organ; and that its energy will be supported and increased by the general fulness of the arterial system. The increasing fulness of this, however, has its limits both from the density of the arteries becoming too great for the force of the heart, and from the resistance of the veins becoming gradually diminished. To explain this latter circumstance, we must remark, that, from the experiments of sir Clifton Wintringham, it appears, that in the beginning of life, the density of the coats of the veins, and consequently their resistance to the reception of blood from the arteries, is proportionally greater with respect to that of the arteries, in young animals than in those that are older: but the density of the arteries, by the action of the heart distending and pressing them, is constantly increasing; while the same power not being applied to the veins, their density is not proportionally increased. From this it must happen, that the density of the arteries constantly increasing will come at length to be proportionally greater than that of the veins, and consequently throw a greater proportion of blood into the latter; and after a certain period, the density of the arteries still increasing and throwing a greater proportion of blood into the veins, the fulness of the arteries themselves will no longer increase, but will rather be further diminished. As we have, however, said above, that the vigour of the system depends much upon the fulness of the arterial system, so, as soon as this last ceases, the former can go on no longer to increase, and will be rather gradually diminishing.

Here, therefore, is another cause of a period being put to the increasing vigour of the system, and at the same time a cause assigned of its thereafter constantly declining. It is sufficiently probable, that both these causes take place together at the same time of life; and with great reason it may be supposed to be nearly at the age of thirty-five.

The whole of this subject might be further illustrated, by showing that the phenomena, in the decline of life and in old age, may be explained upon the principles we have laid down; but I have not room for such discussions in this work.

I have now considered, under five heads, the chief circumstances of the animal œconomy, and have endeavoured to point out the different conditions in which these may upon different occasions be

found: and in attempting to assign the causes of these conditions, I have shown in what manner, and upon what occasions, they may be different in different persons.

OF PARTICULAR TEMPERAMENTS.

It has thus been my endeavour to lay some foundation for distinguishing the temperaments of men: but these temperaments, as has been already observed, are not to be distinguished by attending to any one of these chief circumstances alone; for the state of any of these is commonly combined with a particular state of all the others; and it is only by a combination of the particular states of the chief circumstances in the same person, that the temperaments are to be properly distinguished. To explain this, we presume, that in any one person a particular state of the simple solid is pretty constantly combined with a particlar state of the fluids, with a particular state of the distribution and proportion of these, and all these with a particular state of the nervous system; and as such a combination may be formed in another person, but consisting in a difference of the particular states of each of the chief circumstances, this will give a different temperament in these two persons. So far therefore as we can find such combinations to be steadily formed in any particular person, we shall be able to assign his particular temperament.

It must, however, be acknowledged to be uncertain, how far certain states of the chief circumstances of the œconomy are steadily connected together, and therefore how far we can extend our doctrine of temperaments to a great number of different men; but at the same time, it is only by *presuming* upon a certain steadiness of these combinations, that we can go any length in explaining the difference of temperament.

The ancients very early established a distinction of temperaments, which the schools of physic have almost universally adopted ever since, and appears to me to be founded in observation. I am very much of opinion, that we can perceive a combination of a particular state of the chief circumstances of the œconomy to take place very steadily in certain persons, and thereby to form at least two of the temperaments assigned by the ancients. Accordingly, the circumstances in which these two temperaments seem to consist, we shall now endeavour to explain; and I shall hereafter consider how much farther we may proceed.

In doing this, it will be proper, in the first place, to mark out the several external appearances that concur in the same person;

and from which concurrence taking place in many different persons, we are led to presume in these, one and the same combination or temperament.

One to be particularly mentioned, is that temperament which the ancients, and which physicians at all times since, have distinguished by the appellation of the Sanguine. In this, the external appearances are the following. The hair soft, and never much curled, is of a pale colour, or from thence passing through different shades to a red; the skin is smooth and white; the complexion ruddy; the eyes commonly blue; the habit of the body soft and plump; after the period of manhood disposed to obesity, and at all times readily sweating upon exercise; the strength of the whole body is moderate; and the mind sensible, irritable, cheerful, and unsteady.

Before going further, it is necessary to observe, that as no exact measure can be had of the different degrees in which the qualities we are to mention take place, I suppose a middle state very nearly ascertained by observation; and I am unable to give any other measure of qualities than merely by marking them as below or above the middle state.

Upon this footing, I would explain the sanguine temperament as consisting in the following state of the several chief circumstances of the œconomy. I suppose the simple solids to be lax; the mass of blood to be of a moderate consistence; the red globules and serum to be in large proportion; and the serosity to be of moderate acrimony. I presume the heart to be active, and rather strong with respect to the system of blood-vessels: the quantity of blood in the arteries large with respect to that in the veins; and the quantity of fluids in the whole body large in proportion to the quantity of solid; the state of the nervous system to be sensible and irritable, but in every state readily changeable. This temperament is most exquisite from the time of puberty to that of manhood; but continues its character in some measure throughout the whole of life. This temperament is liable to hemorrhagy, inflammation, and hysteria; and with the ancients made the *temperamentum calidum et humidum.*

The other temperament distinguished by the ancients, which I can characterise most distinctly and explain most clearly, is that which has been very constantly named the Melancholic. In this, the external appearances are the following. The hair is hard, black, and curled; the skin is coarser, and of a dun colour, with a corresponding complexion; the eyes very constantly black; the habit of the body rather hard and meagre; the strength considerable; the mind slow, disposed to gravity, caution, and timidity, with little sen-

sibility or irritability, but tenacious of all emotions once excited, and therefore of great steadiness. In this temperament, I judge the simple solids to be firm and dense; the mass of blood to be of a thicker consistence; the gluten abundant; the red globules and serum in moderate quantity, and the serosity more acrid; the heart rather torpid, but strong; the quantity of blood in the veins large with respect to that of the arteries; and the quantity of fluids in the whole system moderate in proportion to the solids; the state of the nervous system to be, as expressed above, by the state of the mind, that is, less sensible and irritable, but strong and steady, and disposed to admit the reflex sensations of sadness and fear. This temperament is most completely formed in advanced life; but the characters of it appear often very early. It is liable to melancholia, hypochondriasis, mælena, and hæmorrhois; and with the ancients made the *temperamentum frigidum et siccum*.

These are the two temperaments we can the most clearly distinguish; because they are almost in every respect the opposites of each other.

With respect to both, I think some illustration may be obtained, from considering what happens to every person both in the body and the mind during the progress of life. Of these changes I have already spoken pretty fully, when treating of the strength and weakness of the nervous system. From the circumstances there pointed out, it will appear, that those which chiefly determine to a sanguine temperament, occur especially in the first part of life; and that those which determine to the melancholic, as certainly occur in the after parts of it. Accordingly, from the effects we may conclude to the causes, especially when at the same time the existence of such causes is clearly ascertained; and therefore we may venture to assert, that the changes which happen in the course of life do well illustrate the doctrine laid down respecting these two temperaments, the sanguine and the melancholic.

A further illustration to the same purpose may be drawn from the consideration of the sexes: for it is obvious, that the circumstances of the sanguine temperament, both in the body and the mind, appear more prevalent in the female sex; while a greater density and less flexibility of the simple solid, with a proportional greater density and less mobility of the nervous power, make the character of the male sex approach nearer to that of the melancholic.

I have thus endeavoured to explain the different states of the human body, by referring them to two general states or tempera-

ments, which not only serve to distinguish the most part of men through the whole of life, but also to distinguish the different sexes, and likewise the state of particular persons as they pass through the different ages of life. Our doctrine, therefore, will apply very extensively; but perhaps it may not seem to be very readily applicable to that great variety which would appear to take place in the human constitution.

With a view, therefore, to attempt some explanation of this variety, we shall remark, in the first place, that it may in some measure depend upon the two temperaments, which we have supposed chiefly to prevail, being seldom perfectly formed; or, in other words, upon the particular state of the circumstances in which they consist, being seldom found in the most complete degree. For example, it is seldom that in the sanguine, the simple solid is the most lax, or in the melancholic the most rigid, that is compatible with health. There is reason to suppose, that from the medium state of density and firmness in the solid, there may be various intermediate degrees between the most lax upon the one hand, and the most rigid upon the other; and supposing that with each of these intermediate degrees, there is united a corresponding state of the nervous power, there may then be so many intermediate and seemingly varying temperaments, neither completely sanguine nor melancholic, though always approaching to the one or the other. This may explain, in some measure, the varieties in the temperaments of men, but it may be justly doubted if it will account for the whole.

It will therefore be proper, in the second place, to observe, that it is doubtful if the chief circumstances of the œconomy are always in the same proportion to one another that has been above supposed. For example, we have supposed that the density and the mobility of the nervous power are always in a certain proportion to one another: but this is not very certainly the case; and if we may suppose, as seems to be allowable, that in two persons, the density being equal, the mobility may be greater in the one than in the other; so that, if this should happen, it will be obvious that it might give a more exquisite formation of the sanguine, or a more moderate state of the melancholic temperament. In this way, it is possible, that with a certain degree of density greater than usual in the sanguine, there may be a mobility greater than in proportion to this, we shall then have a middle temperament between the sanguine and the melancholic, and perhaps what the ancients meant to denote by the title of Choleric; that is, of more

strength than in the sanguine, and of more irritability than in the melancholic. It is possible also, that there may occur a simple solid more dense than usual in the sanguine, and at the same time from a more humid state of greater flexibility than in the melancholic; and if, along with these, there be an analogous state of the medullary fibre of less mobility and elasticity in proportion to the density, we shall then have that temperament which the ancients expressed by the title of Phlegmatic; that is, with less sensibility and irritability, but with more strength and steadiness, than in the sanguine, and at the same time with more laxity and more mutability than in the melancholic.

In the whole of this discussion, we have considered the state of the nervous power as chiefly modifying the temperaments of men; and more readily enter into this supposition, because we presume the state of the nervous power to be almost always attended by a corresponding state of the simple solid, and that both these together pretty constantly modify the state of the fluids, both with respect to their quality, their proportion, and distribution.

Of these latter circumstances, however, constantly following the state of the simple solids and of the nervous power, I am by no means certain. As we observe that at different periods of life there is a difference between the arteries and the veins, as to the circumstances of density and capacity; so it is possible, that some difference in these respects may be established in the original stamina, and may therefore in some degree run throughout the whole of life, and thus vary the state of the fluids. It is also possible, that there may be conditions of the original stamina, determining a difference in the strength and activity of the heart with respect to the capacity of the blood-vessels; or, on the other hand, the state of the heart being given, there may be a difference in the density and resistance of the sanguiferous system. In all these cases, there may arise a difference in the quality, proportion, and distribution of the fluids, and thereby a further variety in the temperaments of men: and thus perhaps we may account for the difference of stature, bulk, and proportion, of the several parts of the body in different persons.

All this might be illustrated more fully; but perhaps we have insisted long enough upon what may by many be thought perhaps too much depending upon conjectural reasonings. It no doubt may, in some respects, be liable to this imputation; but I should fain hope that it may serve to lay the foundation of speculations

which must be pursued before we can explain the important, and therefore necessary, doctrines concerning the temperaments of men.

On this subject, it is very requisite to remark further, that the consideration of the operation of medicines is not only concerned with the general state or temperaments of the human constitution, but also very much concerned with the peculiar conditions which take place in particular persons, or in particular parts of the body; and which conditions are seemingly neither depending upon, nor necessarily connected with, the general temperaments.

OF IDIOSYNCRASIES.

THESE conditions are what physicians have called *Idiosyncrasies.* The term has been confounded with that of temperaments; but I mean here to express by it those conditions of certain persons, whereby certain functions of the whole or of particular parts of the body are affected by applications made to them, very differently from what these functions are affected in others, and very differently from what they are in persons seemingly of the same general temperament.

Of these idiosyncrasies, the greater part of them seem to me to consist in a preternatural degree of the sensibility or irritability of certain parts of the system, or in a peculiar sensibility or irritability of the whole body, or in particular parts of it with regard to certain applications, and to those only.

Of such idiosyncrasies, those that have been the most taken notice of are those which occur with respect to the effects of taste and odour. Tastes are of considerable variety; but they are reduced to certain classes and orders, in which the most part of men are so well agreed, as to show that the operation is nearly the same in all of them. This certainly happens with respect to the simple sensation; but with respect to the reflex of agreeable or disagreeable, this is often considerably different in different persons, and shows that there is room here for an idiosyncrasy, which accordingly takes place; and there are many instances of it in the records of physic.

The instances, however, of a peculiar aversion in particular persons to certain odours, are much more frequent. The records of physic are full of them; and examples of them are known almost to every body. The sensations arising from odour seem to be more various in different men than those arising from taste; so that mankind have hardly established any other distinction of the former than that of agreeable or disagreeable. Subdivisions have been at-

tempted, but with no consent of mankind, so as to be expressed with any precision in common language. The sensation, therefore, is probably much varied in different men, and gives room for idiosyncrasies, which accordingly appear without our being able to refer them to any particular classes or orders of odours; and the effects are not less remarkable by the operation of the same odour upon different persons, than by its being so powerful in its degree, producing syncope, hysteria, and epilepsy.

These peculiar effects of sensations are manifestly extended to the alimentary canal. In this, and particularly in the stomach, the sensibility is not correspondent to the general sensibility and irritability of the whole system: for there are instances of strong persons moved by very small doses of emetics; whilst, on the other hand, there are seemingly weakly persons who are not moved but by very large doses of the same.

There are instances of sensibility in the stomach that are peculiar to certain persons, and appearing in few others. But I must acknowledge, that with regard to several of these idiosyncrasies, it is not easy to determine whether their effects depend upon an impression made upon the nerves of the stomach, or upon a modification which these substances give to the fermentations and solutions that take place there. For example, if fresh honey gives pains of the stomach to certain persons, as this is obviated by boiling the honey before it is taken into the stomach, it may be a doubt whether this volatile part of fresh honey operates by an impression upon the nerves of the stomach, or by exciting a more active fermentation there. The acescent fermentation which occurs always in a greater or lesser degree, is manifestly more or less readily excited in different persons; for we know many persons who take in acids and acescents in large quantities, without any appearance of a stronger acescency being excited; while I have known certain others, from a very small quantity of acescents taken in, have the strongest marks of a morbid acescency immediately produced.

We know so little of the gastric fluid, and of its operation on different substances, that it is very difficult to explain the idiosyncrasies which take place in certain persons and not in others, with respect to milk, oils, shell-fish, and some other substances. One of the most remarkable is this, that the white of egg, one of the mildest substances in nature, and readily digested in almost all the stomachs of men, cannot however be taken in, even in small quantity, by certain persons, without immediately occasioning much pain and sickness.

In any attempts to account for these peculiarities, it ought to be kept in view, that the stomach is not only affected by sensations depending upon impression, but likewise by those which depend upon consciousness, or a perception of the state of its own action; and that undoubtedly many of its sensations are of the latter kind.

It does not seem necessary to enter upon the consideration of the idiosyncrasies of the intestinal canal, as they are to be explained from the same degree of sensibility that may be peculiar here as in the stomach. What farther may arise from a peculiar state of the bile or other fluids poured into the intestines, we cannot pretend to judge. The various state of the alvine excretion depends upon many different causes, which there is no place for considering here; but it is most likely that some of these causes may be more considerable and peculiar in certain persons than in others, and give an idiosyncrasy in that respect. A torpor, or slower motion of the intestinal canal, is especially to be suspected.

We have thus endeavoured to mark out the various cases of idiosyncrasy; and although perhaps we may not have done it completely, yet it is hoped enough has been said to show, that in the employment of remedies a physician must be directed by the consideration of idiosyncrasies as well as by the general temperament.

In the case of any person, therefore, occurring to a physician for the first time as a patient, particular inquiry should be made respecting the idiosyncrasies which may prevail in his constitution; and if he himself should happen to have had no experience of the effects of particular applications, the idiosyncrasies of his parents should next be inquired after; for idiosyncrasies are very often hereditary.

We have thus attempted to point out the various states of the human constitution that may be found more constantly different in different persons; but it will be proper now to remark, that these constitutions may be variously modified by those circumstances of climate, diet, exercise, and the like, to which men may be exposed in the course of life, and which it is well known have a great power in changing the natural constitution into one not only very different, but perhaps, even opposite. It is therefore well known that a phypician, in practising upon the human constitution, either for the preserving of health or of curing diseases, must not only consider the temperaments and idiosyncrasies which nature has originally given to the constitution, but must also consider the accidental states

of it, which may have been produced by the circumstances and manner of life.

It is, however, not my business here either to explain those various accidental states, or to assign their causes; although it might be proper enough to lay a foundation for that doctrine by explaining the powers of custom and habit in general, as I formerly endeavoured to do in my lectures on the materia medica. It does not, however, appear to me necessary to do it now, because for a pretty full information on this subject, I can refer to a Dissertation de *Consuetudine*, published some years ago by my son Dr HENRY CULLEN; and another edition of which I hope he will soon give in a still more complete form in the English language.

To conclude what we have to offer respecting the operation of medicines, it is proper now to remark, as I have said above, that in considering this subject, it is very necessary to attend to the sympathy and consent which takes place between the several parts of the human system; and although we cannot prosecute this consideration fully here, we must not omit taking notice of one very general case of very great influence in almost the whole of the doctrines of the materia medica, as this particular sympathy is concerned in the operation of the most part of medicines, and explains the operation of many which is otherwise difficult to be understood.

This is the operation of medicines upon the stomach, from which motions are often propagated to almost every distant part of the human body, and peculiar effects produced in those parts, whilst the medicine itself is only in contact with the stomach.

The stomach is the part by which the most part of substances introduced into the interior parts of the body generally pass; and it is endued with a peculiar sensibility, which renders it ready to be affected by every substance entering into it that is active with respect to the human body. Every thing, therefore, of this kind introduced into the stomach, operates almost always there, and for the most part only there. It is now, however, well known to physicians, that the most considerable instance of the sympathy mentioned above, is afforded by the stomach, so connected with almost every other part of the system, that motions excited there are communicated to almost every other part of the body, and produce peculiar effects in those parts, however distant from the stomach itself. This indeed is very well known; but that the effects of many medicines which appear in other parts of the body are en-

tirely owing to an action upon the stomach, and that the most part of medicines acting upon the system act immediately upon the stomach only, is what has not been understood till very lately, and does not seem even yet to be very generally and fully perceived by the writers on the materia medica. It will therefore be proper here to say in what manner this doctrine may be established.

1*st*, That medicines showing considerable powers with respect to the whole system, act especially or only on the stomach, will appear from all those cases in which the effects appear soon after the substance has been taken into the stomach, and before they can be supposed to have gone further into the body, or to have reached the mass of blood. Thus, Sir JOHN PRINGLE, from the sudden operation of the Peruvian bark, in preventing the paroxysms of intermittent fevers, properly concludes, that it cannot be by its antiseptic powers with respect to the fluids, but by a certain operation immediately upon the stomach. See Diseases of the Army, Appendix, p. xxv.

2*dly*, As medicines are commonly in the first place applied to the stomach; so all those of volatile, active, and penetrating, parts, must immediately and especially act upon the stomach: and from this consideration, as well as from the suddenness of their effects which commonly appear, we may conclude their action to be upon the stomach only. Accordingly, I conclude that the action of the volatile alkali, and some other saline substances, is upon the stomach alone, and very rarely by any antiseptic powers with respect to the fluids.

3*dly*, Though medicines do not to the taste or smell discover any volatile or active parts, yet if their effects depend upon the change which they produce in the state of the nervous power, it is hardly to be doubted that they operate only upon the sensible and irritable parts of the stomach. This I conceive to be the case of opiates and of most other narcotic powers, whose substance is known to remain in the stomach long after they have discovered their effects in the most distant parts of the system.

4*thly*, If there are medicines supposed to act only when they come in contact with the parts they are supposed to act upon, and that a certain quantity is necessary to be applied to these parts; and further, if such medicines are either thrown into the stomach in small quantity, or are of a nature to be slowly dissolved there, so that they cannot be supposed in sufficient quantity to come in contact with the parts they are destined to act upon, whilst however

their effects appear in these parts; it must, I think, be concluded, that these effects depend entirely upon the operation of these medicines upon the stomach. This, if I mistake not, applies to the case of most vegetable astringents, and perhaps to the fossil also, whose effects, and especially their sudden effects, upon distant parts of the system, can only be accounted for by their operation upon the stomach.

5thly, Another circumstance leading us to suppose that medicines act immediately upon the stomach, and by their operation there, affect the rest of the system, is the consideration of all these cases where they affect the system very generally, while at the same time they act both suddenly and in small quantity, and therefore in circumstances which cannot allow us to suppose that they are conveyed in substance to the parts in which their effects appear. Thus, as has been above observed, medicines which act very generally upon the nervous system, or upon the particular parts of it remote from the stomach, cannot be supposed to be transferred in substance to the whole, or even to the particular parts of that system; and therefore must necessarily be supposed to act in the stomach only. Not only, however, with respect to the nervous system, but also with respect to the sanguiferous, any very general effects produced there, as for example a sweating excited universally over the whole body, can be produced no otherwise by internal medicines, excepting by such as act on the stomach, and from thence communicate a stimulus to the heart and arteries. In many cases of increased evacuations, it is indeed pretty evident that the medicines exciting the evacuations are actually conveyed and applied to the secretories or excretories of the parts concerned; but this cannot possibly be supposed with regard to sweating, not only from the small quantity of medicine employed, but perhaps also from the nature of the excretion, which is certainly not depending upon glands and their excretories.

6thly, Another circumstance inducing us to suppose medicines to act only on the stomach, is, that of their being capable of being changed by the assimilating powers of the stomach and intestines; for such medicines, if they act at all, must act immediately upon their entering into the stomach, or before they are changed by digestion.

It is true, with respect to vegetables, and also certain animal substances, it is often a certain portion of them only that can be subjected to our digestive powers, while the medicinal part of the same is hardly affected; and therefore it may be alleged, that

their operation on the interior parts is not prevented by the powers of digestion. This indeed does certainly sometimes happen: but still, as digestion breaks down very entirely the texture of vegetables, and evolves the several parts of them more entirely than they were in the entire vegetable, it thereby gives them an opportunity of acting immediately upon the stomach, and even may thereby prevent their activity from reaching beyond this organ.

7thly, Another circumstance which confines the operation of many medicines to the stomach, is their suffering a change there, if not by digestion at least by mixture.

It appears to me very clear, that in all animals who take in a quantity of vegetable aliments, and therefore in man, there is an acid, and commonly in considerable quantity, very constantly present in the stomach. It is therefore probable, that all alkaline substances are more or less neutralized there; and that consequently, if they act at all as naked alkalines, they can act only upon the stomach before they are neutralized. It appears, however, that alkaline substances frequently prove powerful medicines with respect to the remote parts of the system; and I think it must be concluded that their effects must be imputed to their being changed into neutral salts in the stomach, and operating in the other parts of the system as neutrals only; or perhaps their operation may be that of their changing the nature of our fluids, by their abstracting a considerable portion of the acid which should have entered into the composition of these fluids.

On this subject of the changes which substances undergo in the stomach, it is to be observed, that the acid of the stomach operates in this respect in two ways.

1st, The acid may be applied to compounds, consisting of an alkali, and another part which has a weaker attraction to the alkali than the acid of the stomach. In such case, the acid of the stomach is joined with the alkali, and throws loose the substance before joined with it, so that the compound can no longer act in the form in which it was thrown into the stomach; and this I think happens with respect to all soaps taken into the stomach, and which therefore cannot have any of the effects which their saponaceous form has been supposed to produce with respect to our fluids.

Another effect of a like resolution by the acid of the stomach, is, in the case of neutral salts formed of an alkali with the acid of tartar; which, with respect to alkali, seems to have a weaker attraction than the acid of the stomach. It is therefore that we are so often disappointed of the operations of soluble tartar; and if we are

not, it must be imputed to the neutral formed of an alkali with the acid of the stomach, being as powerful a laxative as that formed of the acid of tartar.

2dly, There is another case in which the acid of the stomach acts, and that is when it is applied to certain earthy and metallic substances, which are not soluble in our fluids, and are therefore, with respect to our bodies perfectly inert; but by having the acid of the stomach applied to them, they are often changed into very active medicines, as we know to happen with respect to magnesia alba, and to several preparations of antimony and mercury.

CHAPTER II.

OF THE SEVERAL MEANS OF OUR LEARNING THE VIRTUES OF MEDICINES.

WE have already said, that mankind very early became acquainted with the medicinal virtues of some substances not employed in diet; and we can easily conceive in what manner such knowledge might be acquired, although we cannot apply our conjectures on this subject to particulars, and hardly at all to the many particulars that seem to have been very early employed by the practitioners of physic. It may naturally be supposed that these practitioners, intent upon increasing the number of remedies, might, by accidental observation, by random trial, or as guided by some analogy, discover new remedies, and thus increase their number, and retain those especially which experience seemed to confirm.

Upon this footing it has been alleged, that the numerous remedies mentioned by Dioscorides and other ancient writers, were entirely the fruits of experience: But from what we have said in our History, and what we shall hereafter say respecting the fallacy of experience, it will be very evident, that as to most of the medicines employed, experience has had a very small share in establishing the virtues which have been commonly ascribed to them. Those disappointments in practice which have so frequently occurred from following the ancients, have very properly engaged modern physicians to seek for means not only of ascertaining more exactly the virtues of the medicines in use, but likewise for investigating the virtues of substances before untried.

For this purpose the chemists made the first attempts; and Paracelsus introduced the absurd notions of astral influences and

of signatures; while succeeding chemists have suggested the utility of a chemical analysis. The two first of these have been now long ago absolutely exploded, though their effects have not yet entirely disappeared in the writings on the materia medica. The third means of a chemical analysis, though not entirely useless, does not go a great way for the purpose we are inquiring after.

The means which at present are more especially resorted to and cultivated, are those taken from Chemical Examination, from Botanical Affinity, from Sensible Qualities, and from Experience; and the application of each of these I shall now consider with all possible attention.

ARTICLE I. *Of the Use of Chemical Resolution in investigating the Virtues of different substances.*

WHEN the employment of chemical remedies became first considerable in the hands of PARACELSUS and his followers, it was accompanied with such visionary and absurd theories, as quite confounded and greatly corrupted the doctrines of the materia medica; but in progress of time chemistry corrected its own errors, and has come at length to be of the greatest utility in improving the materia medica. It has done this, by ascertaining more exactly the qualities of the medicines before known and employed; and in particular, it has not only greatly relieved the materia medica, by rejecting the inert and superfluous, and by marking the degree of qualities in similar substances, but it has directed to a more judicious choice of these. Besides thus correcting and improving the ancient materia medica, it has certainly given a valuable new one, by the many new productions which it has discovered, and by the preparations it has invented or improved. Almost the whole of the saline substances taken from the three kingdoms, are the fruits of chemistry; and the inflammable matters, except the expressed oils and a few fossil substances, are also the productions of the same art.

Such have been the advantages obtained from chemistry in affording many, and some of the most efficacious, particulars of the materia medica; and to the choice and proper use of the whole, an accurate knowledge of chemistry is absolutely necessary.

It has, however, been also supposed, that this art has actually been, or might be, useful in investigating the virtues of vegetable and animal substances; although it does not appear to me to have been in this particular successful. What has been called the Chemical Analysis, or the distillation of substances without addition,

has not answered the expectations entertained of it. After many very competent trials, it is now agreed, that such an analysis affords no correct nor certain information concerning the constituent parts of mixts; and the application of this kind of resolution, therefore, is now entirely, or at least very much, neglected.

The chemical resolution now attempted, is that which is supposed to separate the parts of mixts without changing or much altering their nature. Thus, by a distillation of plants with water, we obtain their oils very entirely separate from their other parts, and in such condition as we suppose them to have existed in the living plants. By the application of different menstruums, under different degrees of heat, we suppose that we separate as soluble in these different menstruums, parts which existed in the same state in the entire plant; although such a supposition in many cases is to be doutfully admitted, as in the sequel we shall have occasion to remark. But however this may be, we must here observe, that by these practices it is seldom that we discover virtues unknown before, and commonly only find out in what part of the substance the virtue otherwise known more especially resides. By such resolution, indeed, we may upon some occasions find a virtue, that in the concentrated state in which it is obtained, is more considerable than it was as diffused in the entire plant; and sometimes we may seem thereby to find an entirely new medicine: but I hardly know any instances of this, or of our thus investigating virtues not known before. It is possible indeed, that by our finding virtues lodged pretty constantly in parts separated by peculiar menstruums, we may have an analogy leading us to suppose like virtues in the substances which we find to be extracted by like menstruums; but this analogy is very seldom applicable. For example, although we should find the purgative virtue of plants to be commonly residing in the resinous parts of them, we cannot conclude that a plant which yields a resin to a spirituous menstruum is therefore of a purgative quality; and I will venture to assert, that the analogy drawn from chemical resolution goes but a very little way in investigating virtues.

Here, however, it would be improper to omit acknowledging the great utility which has been derived from the labour that has been bestowed in examining the various subjects of the materia medica by the solution of them in different menstruums. These labours have certainly ascertained the proper pharmaceutical treatment of many substances, and have thereby very much improved our knowledge of the materia medica, especially with respect to the

preparations and compositions which form so considerable a part of it.

I have thus acknowledged the general utility of these labours, and shall have occasion in another place to say to what extent they are more particularly useful.

Article II. *Of the Use of Botanical Affinities in ascertaining the Medical Virtues of Plants.*

It has happened, I think unfortunately for the materia medica, that the botanists have deemed it incumbent upon them not only to distinguish plants from one another, as was their proper business, but also to point out their medical virtues; a task to which they were often very unequal.* They have, however, commonly attempted it; and have done it in the most imperfect manner, for they have commonly compiled merely from preceding authors, with very little choice or judgment, and have thereby only multiplied useless and erroneous writings.

This is truly the state of their labours on particular subjects; but the later botanists have thought of much more extensive application of their science, as they have attempted to apply it very generally to the ascertaining the virtues of vegetables.

When the botanists found that vegetables, by a similarity in the parts of their fructification, might be arranged under certain genera, orders, and classes, this arrangement established what I call their Botanical Affinities. This affinity has been shown to apply in a considerable degree to a great number of vegetables, though not yet to the whole of them; but wherever it has been applied to orders and classes, so as to show a very great similarity and affinity amongst all the several species comprehended under them, these are properly considered as natural orders or classes.

After these natural orders came to be properly established, the botanists came to perceive that where a great botanical affinity took place, there was generally also a remarkable sameness, or affinity, amongst the several species with respect to their medical virtues.

This in general was well founded; and such a medical affinity does actually take place, not only in the species of the same genus, but also to a great degree in the species of those orders and classes which may be properly considered as natural. This gives an analogy

* But, surely, the botanists have often, and indeed very often, been equal to this task. Witness the labours of professor Murray, in his invaluable *Apparatus medicaminum*, not to mention many other botanical physicians.

whereby we may very often presume that an untried vegetable is of the same nature and qualities with those of the same genus and order to which it is related by a botanical affinity.

This is truly to a certain extent just, and applicable with some advantage; but it is by no means so universally applicable as the botanists would seem to insinuate, as there are every where many exceptions to be found.

Even in the species of the same genus, there is often a great difference of qualities in the different species. The cucumis melo is very different in its qualities from the cucumis colocynthis.*

In the natural orders, the exceptions are every where still more considerable. In some of these orders, which consist for the most part of the mildest vegetables, there are sometimes those of a deleterious kind; and in certain orders which consist of the most active and powerful substances, there are those of a very inert and mild kind. The lolium temulentum among the gramina is an instance of the first assertion;† and the verbascum among the Luridæ or Solanaceæ, is an instance of the second.‡

Another observation to be attended to in employing the general analogy is, that though the plants of the same order may have a great resemblance in the general quality, they have this in such different degrees, as by no means to admit of an indifferent choice for the purpose of medicine.

A further observation, and of still greater importance, is, that although there be some resemblance in the qualities of the plants belonging to the same order, yet in the several species the resemblance is not only seldom exact, but more commonly there is a peculiar modification in each: and very often with the quality belonging to the order, there is associated another, which is totally different either from that, or from any other of the order, and sometimes of a dangerous kind; so that the heedless practitioner

* I may add, the different species of the genus solanum, or nightshade. How different the qualities, in a medical and dietetic point of view, of the esculent solanum tuberosum, or potatoe, and the solanum nigrum, and most other species of the genus.

† By boiling, and by twice baking, the lolium temulentum, or darnel, is rendered quite innoxious. See the Editor's *Elements of Botany*, vol. i. page 121.

‡ A better illustration of the professor's idea might have been offered. The verbascum (verbascum thapsus) is not wholly an innoxious plant. It at least has something narcotic in its constitution. The leaf, made into pills, kills fish; animals, it is true, very susceptible of the influence of narcotics: and I am assured, that an infusion of the leaves is anthelmintic.

might be very much deceived in trusting to a botanical affinity alone.

It still farther merits attention, that though plants of the same natural order have commonly the qualities belonging to the order, similar in all their several parts, yet this is by no means universal. Plants in general have the qualities of their several parts considerably different, so that the root is often of a very different quality from that of the leaves or seeds; and the resemblance that may be in the fructification, which especially establishes their botanical affinity, is by no means to be extended to all the several parts of the plants agreeing in that affinity. In their several parts, the common quality may not only be in very different degree, but in some of the parts there may be a widely different and even a contrary quality.*

From all these considerations, it will readily appear, that the botanical affinity of plants, though it may be of some use in investigating their medical qualities, cannot be applied to the ascertaining these virtues but with a great deal of caution, and never can afford any certain conclusion, without examining at the same time their sensible qualities; nor even then, except when the supposed medical virtue is confirmed by actual experience on the human body.

ARTICLE III. *Of the consideration of the Sensible Qualities of Substances, as pointing out their Medical Virtues.*

ANOTHER means proposed for judging of the virtues of different substances is, by attending to their sensible qualities of taste, smell, and colour. As we have already remarked that the operation of medicines is chiefly on the nervous system, so that as the sensations of taste and smell depend upon an action of certain substances upon the nerves of the tongue and nose, and their effects are very often from thence communicated to the rest of the body; so it may in some measure be presumed, that those actions on the organs of taste and smell may be communicated to the whole of the nervous system, or may show an analogous power with respect to the system when applied to the other nervous parts of it.

Upon this, indeed, I rest so much, that I presume very confidently to give it as a very general rule, that those substances which do not at all affect the taste or smell, and even those which

* Of this assertion we have many illustrations. Thus, the leaves of podophyllum peltatum are poisonous; the fruit innocent, and esculent; the root, a safe and excellent cathartic.

affect these organs in a slight degree only, may be considered as inert and useless; and that all such substances should be rejected from the lists of the materia medica, excepting a very few, which, though without sensible qualities, may, on this very account, be of a nourishing, emollient, or demulcent quality.

Although physicians have not sufficiently attended to this general rule, they have, however, at all times, from substances being endued with sensible qualities, presumed upon their activity in the human body, and from the state of their sensible qualities have formed a judgment of their medical virtues. It has indeed almost always happened, that from a similarity of taste and smell in different substances, physicians have been ready to suppose a similarity of virtues.

Such a supposition indeed is in many instances well founded; but it has been carried too far, as a similarity of taste and smell in different plants has been supposed to point out with some exactness the same medical virtues. Sir John Floyer, David Abercrombie, Hoffman, and several others since their time, have, upon this plan, given systems of the whole materia medica.

In the sequel, I shall have occasion to make many applications of the general doctrine, and shall endeavour to show how far it may be justly carried; but at the same time, it is very proper here to be at some pains in pointing out the fallacy that attends the universal application of it.

In the first place, there is a considerable difficulty in ascertaining the difference of tastes in different substances. There are some, such as the acid, the sweet, the bitter, and the styptic, which can be very well distinguished from one another, and about which mankind are generally agreed; but there are many other tastes which cannot be comprehended under any one general head. It appears to me that some general heads have been attempted, if not improperly, at least to very little purpose. Thus it has been common to make a general class of tastes under the title of Acrid; but this term expresses the force of impression rather than any particular sensation; and it has always comprehended substances of otherwise very different qualities, which we shall consider more particularly afterwards under the head of Stimulants.

Another title employed with no better success in forming a class of tastes is the Nauseous; which is manifestly too general, as comprehending many which in general have a disagreeable, but at the same time a peculiar taste; in other words, one different from any other, and therefore not to be brought under any general

title. It is obvious likewise that the class of nauseous tastes comprehends many substances of very different virtues ; and this must always give an insuperable difficulty in the arranging virtues according to taste.

Besides the general tastes which we have said are tolerably well ascertained, there are many combinations of these which give a variety of tastes, not to be exactly ascertained, nor always, so far as we yet know, to be taken as a mark of particular virtues.

But further, when we have collected a number of substances under any one of the general classes of tastes, we find the individuals possessing very different degrees of the same quality, and thereby of very different powers. In many instances, indeed, where the quality of the class is prevalent in a plant, it has at the same time joined with it other qualities which give it different virtues from those of the general class. It is needless, however, to insist further here on the fallacy of the general doctrine, because we shall have frequent occasion hereafter to take notice of it, and to point out the many exceptions with which it is to be received.

Bodies which give out a strong scent, whether agreeable or disagreeable, seem to be peculiarly fitted to act upon our nervous system ; and some very powerful medicines are remarkable for this quality. Linnæus, however, carries the matter too far, when he maintains, that odorous bodies act upon the nerves only, whilst sapid bodies act upon the muscular fibres only ; for it is evident that sapids act also, and sometimes very powerfully, upon the nerves.

Whatever may be in this, I go on to observe, that the judging of the virtues of plants from their particuiar scent, is liable to still more fallacy than the doctrine of tastes. Scents are of greater diversity than tastes, and it it still more difficult to reduce them to any general classes. Indeed it does not occur that any other general division can be made of them, than that of the agreeable and disagreeable. It is true that each of these comprehend a great variety, but not to be assorted with any precision under general heads. Linnæus has attempted this ; but it is enough to look at his general titles, and his enumeration of plants under each, to perceive that they give no precise ideas, nor point out any common qualities, but what arise from the general terms of agreeable and disagreeable ; and that even these are considerably diversified in respect of power, and very often show different effects, according to the difference of the persons to whom they are applied. The ana-

logy, therefore, afforded by odours is of exceeding little use in illustrating the materia medica.

LINNÆUS, when he alleges that the virtues of medicines may be known from their sensible qualities, does, besides the taste and smell, suppose that the colour likewise may give some indication of virtues; and accordingly he has the following paragraph: "Color pallidus *insipidum*, viridis *crudum*, luteus *amarum*, ruber *acidum*, albus *dulce*, niger *ingratum* indicat." But nobody possessed of the smallest knowledge of plants can miss to mark so many exceptions to each of these, as to perceive that the attempt to establish such general positions is extremely frivolous and useless.

ARTICLE IV. *Of acquiring the Knowledge of the Virtues of Medicines by Experience.*

AN experience of the effects of substances upon the living human body, is certainly the only sure means of ascertaining their medical virtues; but the employing of this experience is extremely fallacious and uncertain, and the writers on the materia medica abound with numberless false conclusions, which are however supposed or pretended to be drawn from experience. Such, indeed, is the state of this matter, that nobody can consult those writers with any success or safety, unless he is prepared with a great deal of scepticism on the subject; and it has been owing to want of discernment in this matter, that the writers upon it have compiled one after another so many particulars that are frivolous and false. It may be useful, therefore, to students, if we shall here point out the many mistakes and falsehoods which seem to have been drawn from pretended experience.

The first instance to be given of this, is with respect to those supposed remedies which, both from their nature and from their being placed at a distance from the human body, cannot be supposed to have any action upon it. Such are the various charms, superstitious practices, sympathetic powers, and inodorous amulets, which have been formerly employed. These are indeed in the present age very generally neglected; but it serves sufficiently to show the fallacy of experience, that formerly those remedies had numerous testimonies in their favour. Mr BOYLE thought he had seen with his own eyes the operation of the sympathetic powder; and he had the testimony of divers physicians and other sober persons in its favour. It is not necessary at present to give other instances of this; but if it were proper to do it, we would refer to the second volume of the Acta Naturæ Curiosorum, Observa-

tion 195, a collection of old women's tales, countenanced by the publication of them by a learned society within these forty years. Here is a specimen, Art. xxi. *Lactis abundantia et defectus.* "Pro certo affirmarunt mihi nuper matronæ binæ prudentes et honestæ, se in seipsis efficaciam seminis nigellæ multoties expertas esse, quod nempe retro appensum lac abundans discusserit, antrorsum autem auxerit." It is indeed to be regretted that such remedies are not yet every where sufficiently exploded, when we find so eminent a practitioner as the late Mr De Haen showing some faith in the verbena employed as an amulet. But a person who like him believed in magic, must have been exposed to every superstitious fancy.

Another instance of false experience I would give, is with respect to the virtues imputed to several substances, which, though taken into the body, pass through it quite unchanged, and are absolutely inert, as they are neither soluble in our fluids, nor endued with any qualities that can operate upon either the solids or fluids of our bodies. Such are the various *Silicious* bodies, from mountain crystal to the gems or precious stones which have formerly had a place in our dispensatories; and which, though now expunged from the British, do still hold a place in many others. Their virtues are still supposed and mentioned by materia medica writers; and when the late Mr Vogel supports the virtue of mountain crystal from his own experience, I have no doubt of his having been deceived in his experiments.

To give a third instance, whenever to substances obviously inert, or such as have little power in changing the human body, and such as are every day taken into it in considerable quantity, without producing any sensible change, we find considerable effects imputed, it may be held to be a mistaken experience. Thus, when the excellent Linnæus tells us that he preserved himself from the gout by eating every year plentifully of strawberries, I am persuaded that he was deceived by a mistaken experience. It is indeed surprising that this eminent person should have been exposed to such a fallacy; but in the writings on the materia medica, there occur hundreds of such fallacies under very respectable names.

In almost all the writings upon this subject, many virtues have been imputed to substances either absolutely inert, or possessed of sensible qualities in a small degree only. These virtues, indeed, are often supposed upon a pretended experience; but practitioners have so clearly discovered the fallacy of this, that now for a long

time past they have been neglecting more and more these inert and impotent substances. The catalogues of the materia medica have been constantly diminishing in the successive editions of our dispensatories; and it has been chiefly by the omission of those useless substances. This, however, in the most part of them, has not gone so far as perhaps it might have done; and here a long list might be given of such as seem to be improperly retained; but we abstain from this at present, as we shall have occasion to do it more properly with respect to most of the particulars hereafter.

A fourth instance of false experience, is when medicines are said to have cured diseases, or to have corrected circumstances of the body, which never existed. An example of this is, when medicines are said to have corrected an atrabilis; a state of the fluids, which all the reasoning of Dr Boerhaave cannot persuade me, to have ever taken place in the human body. It seems to have been a pure hypothesis of the ancients, who were by no means in a condition to judge properly of such matters.

I am inclined to judge in the same manner with respect to the lentor, or preternatural spissitude of the fluids, so commonly supposed by the moderns. That no such morbid spissitude can ever occur, we would not positively assert; but there is hardly in any case evidence of its having actually taken place: and it is probable, that in ninety-nine cases of the hundred in which it has been supposed, it is a mere hypothesis. Considering both this and the false theory with respect to the operation of the medicines supposed to cure it, there can be little doubt in asserting, that it affords many instances of a false experience adduced by writers on the materia medica.

Another example of the same kind occurs with respect to *alexipharmics*, so frequently mentioned. For, not to mention the doubts that might be raised in many cases of fever, concerning the existence of a morbific matter, and the doubts also with respect to the cure of fevers as depending upon the expulsion of such matter, it may be alleged, that not only the doubtful existence of their object, but also the want of any clear evidence of their operation, gives every reason to believe that the alexipharmic powers reported by writers are, for the most part at least, instances of a false experience.

A fifth instance of a false experience adduced, may be found in many cases where a disease does actually take place; but where the operation of the medicines supposed to cure it, is so far as we

yet know, extremely improbable. One example of this seems to be the supposed solution of a stone in the bladder by medicines taken in by the mouth. It is very doubtful if any such medicines are yet known to physicians: but not to enter into the disputes that have lately occurred, and which may still subsist among physicians upon this subject, it is very probable that in the many instances of such a power, reported both by ancient and by modern writers, they afford many examples of a greatly mistaken experience.

Under this head may be mentioned the reports of the effects imputed to medicines, which, though not impossible, are, however, from our late experience rendered very improbable, at least in the many instances in which they have been alleged. An example of this which may be given, is with respect to medicines supposed to promote the menses in the female sex. That there are medicines having such a power, is hardly to be denied; but practitioners have been often disappointed in the employment of the medicines said by writers on the materia medica to have had such a power; and I have had many of the most eminent practitioners of these days giving me this report. There is, however, hardly any virtue more frequently ascribed to medicines than this in the materia medica writers; and it may therefore be asserted, that in few cases those writers have had it ascertained by any proper experience.

Another example of the same kind that may be alleged, is with respect to medicines said to promote urine. That there are medicines of such a power, every body knows; but at the same time every practitioner will allow that it is an effect which he often fails in producing, though employing the medicines recommended for that purpose by materia medica writers: and it may be suspected, that in very many of the instances in which they ascribe this virtue to medicines, they have proceeded upon a false experience, or perhaps upon none at all.

But if the emmenagogue and diuretic powers have been so often falsely ascribed to medicines, this will be more readily admitted to be the case with respect to those alleged to promote the birth of children: and more certainly still with respect to those said to expel the secundines or dead fœtuses. Such medicines have entirely lost their credit with modern practitioners; and if an overweening partiality to the ancients, who so frequently report such virtues, can believe that they were guided by experience, there

can be little doubt in alleging that they have given us numerous instances of a false one.

A sixth instance, and a very fruitful source of false experience, is when effects that do really take place, are imputed to medicines employed, while they are truly owing to another cause; and particularly when effects imputed to medicines do truly proceed from the spontaneous operations of the animal œconomy, or of nature, as we commonly speak. It is hardly necessary to give as an instance of this, the exploded opinion concerning the reunion of fractured bones, which was formerly supposed to be promoted by certain medicines, but is now universally considered as an instance of false experience, as the effect is now judged to be entirely the operation of nature.

This perhaps might have been passed over; but it would not have been so proper to omit taking notice of an instance of the same kind which is still to be found in almost every materia medica writer. It is the imputing to medicines taken in by the mouth, the power of promoting the cure of wounds; and accordingly a very great number of vegetables are still mentioned under the title of Vulneraries. This virtue seems to be very often ascribed to medicines, when hardly any other could be ascribed to them.

It seems to be very generally supposed at present, that the cure of wounds is entirely or chiefly the work of nature, and, if accidental circumstances should not occur to hinder it, that nature will constantly do the business. So far are British practitioners persuaded of this doctrine, that it is extremely unusual for any of them to employ any internal medicine under the title of Vulneraries, or to proceed upon the supposition that any internal medicine can assist in the common cure of wounds. It is indeed possible, that a certain flaccidity of the part affected, may retard the suppuration of wounds, or may dispose them to gangrene; and in such cases our practitioners employ internally the Peruvian bark; but it is the only vulnerary they use: And although in the list of vulneraries given by writers, there may be some medicines which might have an operation analogous to that of the bark, yet I believe this was not at all perceived by the practitioners who formerly employed them: and it is very probable, that the most part of the particular vulneraries recited had little power of any kind; and certainly nothing was to be expected from the injudicious and absurd compositions that were offered under that title.

In how many instances the effects of the operations of nature have been falsely imputed to the operation of medicines, need hardly

be said. From the first beginnings of physic to the present day, it has been generally supposed that many diseases are cured entirely or chiefly by the operations of nature, and that many of the cures supposed to be effected by medicine are often effected by nature alone, or perhaps either by accidental occurrences taking place in the animal œconomy, or by certain external circumstances which have accidentally occurred; and therefore, that in innumerable instances the effects of medicines pretendedly founded on experience are often mistaken and false.

How often this has happened, or how often it has occasioned mistakes in the writings on the materia medica, it is not necessary to say here. It will, however, be allowable to take notice of one instance that has, I believe, occurred in almost every writing upon the subject. This is with respect to the jaundice; a disease taken notice of in all ages, but whose nature has been understood only in in very late times, and so lately that even Dr Boerhaave understood it very imperfectly. It seems to be now very generally agreed, that the disease is never owing to the interrupted secretion of bile, but always to the after interruption of its passage from the liver to the duodenum.

Whether the jaundice may be produced by a reabsorption of bile that has been copiously poured into the intestines, as some physicians have thought, I would not positively determine; but am disposed to believe, that the interruption of its passage already mentioned is very universally the cause of jaundice, by the reabsorption or regurgitation of the bile accumulated in the biliary ducts passing into the blood-vessels. The interruption mentioned may be owing to different causes; but it is sufficient to our present purpose to remark, that in ninety-nine of the hundred instances of the disease, the passage of the bile is interrupted by biliary concretions formed in the gall-bladder, and falling down into the ductus communis; and that it has especially been in cases of this kind that various medicines have been supposed to cure the jaundice: but all of them may perhaps be considered as instances of a false experience. We know of no medicines capable of dissolving biliary concretions, that can be conveyed into the body so as to reach these concretions as they exist in the ductus choledochus communis; and of the hundred medicines which have been reported to have cured the jaundice, there is not one of them that we can conceive to have either the power of dissolving the concretion, or of expeding its passage into the duodenum. These reports, therefore, of their curing the disease, may be considered as so many instances of a

false experience. They have been commonly owing to the fallacia causæ pro non causa. The membranes of the human body readily admit of a gradual and considerable extension; and therefore the coats of the ductus choledochus often suffer such a dilatation as to allow biliary concretions to pass into the duodenum. When this happens, it very soon puts an end to the appearance of jaundice. If, however, at the same time, a person labouring under the disease had been for some time using a medicine recommended for it, the cure is imputed to this; though, for the reasons given above, it could not truly have any share in it.

A seventh instance of false experience is that which has arisen from mistakes concerning the nature of diseases, which, though similar in certain circumstances, are, however, in their nature considerably different. Thus, in materia medica writers, there is nothing more common than the mention of the same remedy for the cure of diarrhœa and dysentery. As astringents they may be useful in the former; but in the latter, especially in its beginning, they are not only useless, but improper and pernicious. When, therefore, they are reported from experience to have cured the latter, it seems to have been either from supposing a case of diarrhœa to be that of a dysentery; or at least from not attending to the circumstances of the case, and from giving that as a general remedy which is adapted only to one particular circumstance of the disease. This is a mode of writing on the materia medica which has introduced great confusion and many pernicious mistakes into the practice of physic.

The eighth and last instance of false experience that I shall mention, is that which has arisen from mistakes concerning medicines. Thus, modern writers have ascribed virtues which they have copied from Dioscorides, to medicines which are very different from those to which the ancient writers had ascribed them, though still vouched by the pretended experience of the moderns.

From this view of the many instances of false experience adduced by writers on the materia medica, and which instances are to be found in almost every writer on the subject, it will appear that these writings are for the most part a compilation of mistakes and falsehoods, against the imposition of which a student should be very much on his guard. It indeed requires more knowledge, discernment, and experience, than the student at the time he commonly enters upon this study can possibly have; but it may be of use to inspire him with general doubt and diffidence: and it is hoped, that the remarks we have taken the liberty of suggesting, may be in some

measure useful both to teachers of the materia medica and to physicians engaged in the practice of physic.

Before dismissing this subject, it is incumbent upon me to observe, that the writers upon the materia medica have reported the false experiences mentioned, chiefly from their mistaken judgment, and rarely under any consciousness of falsehood: But it must, however, be acknowledged, that this last has also unhappily taken place, and that many facts have been obtruded upon the public by persons conscious of their being false. This has happened sometimes from an attachment to particular theories, which their authors have desired to maintain, and have therefore often supported by pretended facts and experiments. Sometimes the same effects have been produced by an attachment to a particular method of cure, or to particular remedies, which their authors supposed they had discovered or invented, and which they have often supported by facts, which perhaps their prejudices have made them suppose to be true, but which they have admitted without rigorous examination of their truth, and sometimes conscious of their falsehood.

This leads me to observe, that a very fertile source of false facts has been opened for some time past. This is, in some young physicians, the vanity of being the authors of observations, which are often too hastily made, and sometimes perhaps very entirely dressed in the closet. We dare not at present be particular; but the next age will discern many instances of perhaps the direct falsehoods, and certainly the many mistakes in fact, produced in the present age, concerning the powers and virtues of medicines.

I have now said enough of the falsehoods which have prevailed, or may further prevail, in writings on the materia medica.

But, upon this subject of the investigation of medicinal virtues by experience, I must still remark, that there are several kinds of experiment which have been not very fitly employed for the purpose. One is, the giving the substances to brute animals, and observing their effects upon these. This is a very proper measure in the investigating the powers of all untried substances, and may give a proper caution with regard to the trial of the same upon the human body; but it can go no farther: for it is well known that the effects may be very different in the two subjects, as some substances act much more powerfully, and others more weakly, upon the human body, than upon those of brutes; and therefore we can draw no certain conclusion from the effects of substances upon brute animals, till they are actually tried upon the human body.

Another mode of experiments for ascertaining the virtue of me-

dicines, has been by mixing them with the blood immediately drawn out of the vessels. This has given us some knowledge of the nature of our fluids, and of the effects of some substances mixed with them in this manner. Perhaps some general conclusions may be drawn from these experiments; but materia medica writers have often drawn conclusions from them, without attending to the difference that may arise from the changes which many substances undergo in the first passages, before they are mixed with the blood, and without considering the difference between the quantities applied in these experiments to a small portion of the blood, and of the quantities that can possibly be introduced by the mouth, and which are to be diffused in the whole of the mass of blood. In consequence of this, many erroneous judgments have been given by writers on the materia medica, as I shall mention hereafter on the subject of the particular medicines, with respect to which these false judgments have been given.

A third mode of experiment employed for investigating the virtues of medicines, has been by injecting them into the veins of living brutes; and such experiments have been frequently made, but have afforded very few conclusions or certain instruction. Whatever are the effects of substances applied in this manner, they must be very different from what they would be if introduced into the body by the mouth; when, by the changes they may suffer in the first passages, and especially from the dilution and diffusion which they necessarily undergo there, cannot possibly have the same effects as when injected into the vessels. It is proper also to remark, that the effects which have generally occurred in consequence of injections into the vessels of brutes, and particularly the coagulation produced by almost every thing thrown in, will, it is believed, long prevent our trying this mode of the application of medicines to the human body.

With respect to both these modes of experiment last mentioned, it must be observed, that the result of the experiments reported is often so contradictory, and such want of chemical knowledge has so often appeared in making the experiments, that at present very few conclusions can be drawn from them.

We have now finished the several subjects which seemed necessary to be considered as an introduction to the study of the materia medica; but before entering upon the particular subjects of it, I think it still requisite to say a few words concerning the plan most proper for a treatise of this kind, or the order in which the several subjects of it may be most properly arranged.

CHAPTER III.

OF THE MOST PROPER PLAN FOR A TREATISE ON THE MATERIA MEDICA.

THE order in which the several subjects of the materia medica have been considered, has been very different in different writers; and which is the most proper, has been disputed about, while many are of opinion that it is of little consequence, which of them is followed. It has generally been thought proper to follow a plan in which the subjects are, according to a certain affinity, brought together, so that a number of them might be for the purpose of medicines considered under the same view. Thus, Dr BOERHAAVE considered them in the order of the botanical system he had formed; and LINNÆUS in the order of his own; in which he is followed by BERGIUS.* But it will, however, be obvious, that as no botanical system in every part of it collects plants by their natural affinities; so it will only be when such systems have many natural classes and orders, that they will collect the subjects of the materia medica, that are at the same time connected by their medicinal qualities; and that consequently this principal object cannot be obtained throughout the whole of any system.

It has accordingly been thought proper to follow the botanical affinities, in so far only as these can be thrown into natural orders; and this, therefore, has been attempted by the learned MURRAY, so far as he has yet proceeded:† but from what we have said above with respect to the imperfection of the botanical affinities in pointing out a similarity of medicinal virtues, it will appear that this plan will not always unite subjects in the latter point of view; and when we consider that there are yet many plants which do not enter into any natural order, these must be disposed of in an arbitrary manner, and probably in an unconnected state. It must be owned, however, that though the scheme of botanical affinities does not entirely answer the purpose, yet it will still go a certain length, and ought not to be neglected in the subdivisions of any general plan that may be assumed.

* Also by Schoepf, and several other writers.

† See Preface, page 33.

It has been supposed by some to be a more eligible plan to unite the several substances, as they happen to be related by their sensible qualities; and this method CARTHEUSER and GLEDITSCH have attempted. This certainly may have its use; but from what is said above respecting the imperfection of this scheme for investigating virtues, it will appear that it will not always unite subjects that ought to be united under the same view; and it will be found, that in the authors mentioned, who have executed it in the best manner possible, the desired effect is by no means produced.

From the difficulty of rendering any of these plans tolerably exact and perfect, some writers have deserted all of them, and thought it best to throw the several articles into an alphabetical order, as NEWMANN and LEWIS have done. If, however, there can be any advantage from bringing subjects of some affinity together, this alphabetical order is the most unfit for the purpose, as by separating similar substances, it must be perpetually distracting to the student. It can therefore have no advantage but that of a dictionary, in referring readily to any particular subject that may be inquired after; but this advantage can be obtained in every plan by means of an index, which cannot be saved even in an alphabetical work, as the different names under which the same substances are known necessarily requires an index comprehending all those different names.

Similar to those of the alphabetical order, are those plans which, after arranging the several articles of the materia medica according to the part of the plant employed, as roots, leaves, &c. have thrown these again into an alphabetical order, as ALSTON and VOGEL have done; but it is obvious that this establishes no connection between the subjects that follow one another, and can have no advantage over the alphabetical order. Further, by separating the consideration of the several parts of vegetables, it will both separate subjects that ought to be considered together, and will occasion unnecessary repetition.

[* The learned Dr ERASMUS DARWIN has favoured the public with a very ingenious idea of an arrangement of the materia medica, into seven articles or classes. Some of these classes are not essentially different from those in the following treatise: but, upon the whole, the classes are too frequently founded upon suppositious theories, and will not, therefore, be likely to continue, with other authors, as the basis of an arrangement of the dietetic and medicinal articles which are employed in practice.*]

[* Arrangements of the materia medica, founded upon a division

of the human body into distinct individual systems, such as the sanguiferous system, the nervous system, the visceral system, &c., have also been proposed and attempted. But our knowledge of the functions and properties of the individual living systems, and especially our limited knowledge of the real extent of operation of medical agents upon them, seem, at present, to render such methods of our science but little desirable.*]

After rejecting all these different plans, it will, I think, appear, that as the study of the materia medica is truly the study of the medicinal virtues, so the plan that arranges the several substances according to their agreeing in some general virtues, will be the best adapted to acquiring the knowledge of these, and will most readily inform the practitioner what different means he can employ for his general purpose. It will also inform him how far the several similar substances may differ in their degree of power, or how far from the particular qualities assigned to each he may be directed or limited in his choice.

As it seems proper that every practitioner ought, as far as possible, to practise upon general indications; so it is evident that his study of the materia medica is especially to know the several means that can answer these. Such a plan, therefore, must be the most proper for giving a student instruction; and if, while medicines are arranged according as they answer general indications, the particulars be likewise thrown together as far as possible according to their sensible qualities and botanical affinities, this plan will have the advantage of any other that has been proposed for presenting together the subjects that ought to be considered at one and the same time, and give the best means of recollecting every thing that relates to them.

Such is the plan I am to follow; and I am particularly willing that this treatise of the materia medica should be considered as giving a therapeutice, or methodus medendi, from which part of the medical system the materia medica cannot properly be separated. It may indeed be alleged, that as the therapeutice must be founded on a particular system of physiology and pathology, so it must be liable to all the errors and fallacies of these: but every treatise on the materia medica which refers the virtues of medicines to general indications, must be exposed to the same objections; and though we cannot presume to say, that our plan in this respect shall be without mistakes, yet our general plan in most of its parts being nearly the same with most other systems, we trust it shall not be very faulty: And as it is a principal purpose of this

treatise to render the methodus medendi, or the establishing of general indications, more correct, and better adapted to the particulars of the materia medica, than it has hitherto been, so it affords a particular reason for our following this plan; which in general is very much the same with that of Dr BOERHAAVE in his treatise *De Viribus Medicamentorum*, and such as has been followed by several late authors, as SPIELMAN, LOESECKE, and LIEUTAUD.*

In following this plan, I shall have occasion to employ some general terms in a sense different from that of other writers: and, therefore, that I may be afterwards more easily understood, it is judged necessary here to give some explanation of these terms; and at the same time, as I shall be frequently obliged to mention also the terms employed by other writers, it is judged necessary likewise to explain in what sense these are to be taken.

To do this properly, I think it may be of service to students of the materia medica, if some pains shall be taken here to explain the whole of the general terms employed by writers on this subject. In doing this, I shall, with respect to each term, endeavour to say in what sense it has been commonly or particularly employed; with what propriety it has been used; why I do not employ it; and very often why it should not be employed at all. For this purpose, I shall throw the whole of the terms into an alphabetical order, and thus give a dictionary which I hope may be useful and convenient for persons entering upon the study of the materia medica. In doing this, it seems proper and necessary to give the appellations as employed by Latin writers; and if upon any occasion the explanation of an English term is sought for, it will be readily found by the help of the index placed at the end of this volume.

* The Editor, in his lectures, adopts some of the classes of Dr CULLEN, abolishes others, and establishes new ones, two of which are introduced at the close of this work.

DICTIONARY

OF

THE GENERAL TERMS

EMPLOYED BY

WRITERS ON THE MATERIA MEDICA.

A.

Abluentia, *Abluents.* Medicines suited to wash off from the external or internal surfaces of the body any matters, improperly adhering to them. They are either water or other fluids, which can act by their fluid quality, and may be in the form of lotion, gargarism, or injection. The term of Abluent is seldom employed, and more commonly that of *Abstergent* or *Detergent;* and under these titles are commonly mentioned medicines, which not only by their fluidity wash off adhering matters, but such also as are supposed to do it by their power of resolving and loosening the cohesion of the adhering matters. In this sense, however, these terms are too general, and therefore ought not to be employed; and when they have been employed with respect to the internal parts, it has generally been upon a false supposition of their power of resolving viscid substances, which we shall hereafter endeavour to show to be commonly mistaken.

Abortiva, *Abortives.* Medicines capable of occasioning an abortion in pregnant women. These medicines have been otherwise named Amblotica and Ecbolica; and they are commonly supposed to have also the power of promoting the natural birth, of forcing off the placenta, and even of expelling a dead fœtus. These last mentioned powers, though frequently ascribed to medicines by the ancients, seem to me, and perhaps to most physicians of these days, to be imaginary, and accordingly such medicines are now hardly ever employed. There is little foundation for supposing the power of any medicines to be specifically determined to the uterus; and seemingly there are no other abortiva than such as produce their effects by a violent general operation.

Absorbentia, *Absorbents.* Dry bodies, suited to suck liquids into their pores. In this general sense the term is now very sel-

dom employed, and is almost strictly confined to certain earths suited to take acids into their pores, and at the same time to destroy their acid quality. They will be considered hereafter under the title of Antacida.

ABSTERGENTIA, *Abstergents.* See Abluentia.

ACOPA. Medicines, and particularly unguents, suited to take off the lassitude induced by exercise and labour. The term may be employed for some general measures to this purpose; but I know of no medicines suited to it, except by a general quality, and therefore would admit of no such title to be applied to medicines.

ACOUSTICA. Medicines suited to cure deafness, or other defects of hearing. This is an instance of those general terms which have confounded the materia medica and the practice of physic. As deafness, or any other disease, may depend upon different causes, and such as may require different and even opposite remedies, students cannot be properly instructed, unless remedies are pointed out as suited to the particular cause and peculiar circumstances of the disease. It is possible, indeed, that a practitioner may have found a deafness relieved or cured by a certain remedy, when he could neither ascertain the state of the disease, nor the operation by which the remedy was useful; and I would not refuse to mark such facts: but while matters are on that footing, they can only lead to a random empirical practice, which every body knows has been not only useless, but frequently hurtful. Such general terms, therefore, as *acoustics*, serve to mislead rather than instruct, and should never be employed.

AGGLUTINANTIA, *Agglutinants.* Medicines suited to cement and reunite soft parts preternaturally separated, and therefore employed in wounds and ulcers; but our British surgeons neither know such medicines, nor employ any, supposing them to be such. They suppose the business to be entirely the work of nature, and their own function to be only the removing any impediments that may occur to that.

The term of Agglutinants has also been employed by QUINCY, and perhaps some others, for medicines suited to supply the vacuities formed by the abrasion of the solid parts, either produced by the constant motion of the fluids over them, or perhaps by the motion of the solid parts upon one another; but the supposition of the disease is upon a very doubtful theory, and the supposition of the operation of the medicines is not less so. If the term has any

foundation at all, it must be upon the same with that of nutrient; and there is no propriety in employing a doubtful theoretical term.

ALEXIPHARMACA, *Alexipharmics*. Medicines supposed fit to preserve the body against the power of poisons, or to correct and expel those taken into the body. The same are mentioned also under the titles of *Alexiteria* and *Antidota*; and upon the supposition of their being fitted to expel the poison of animals, also named *Theriaca*. In our history of the materia medica, we have said that the study of poisons and of antidotes appeared very early among the physicians of Greece and Rome, and continued to be a great part of their study so long as the Greek physic lasted: from whence the number of antidotes and theriacas so frequently mentioned in those ancient writers. We have likewise in the same place taken notice of the injudicious compositions by which the ancients attempted the correction of poisons, and with respect to which hardly any body now-a-days doubts of their having been as unsuccessful as they were injudicious; and therefore it may now be said that the terms were very improperly employed.

The modern physicians, however, and particularly the Galenists, adopting very much the ideas of the ancients, have therefore continued their medicines; and the moderns have further transferred the notion from the case of poisons evidently taken into the body, to the case of noxious powers frequently taken in from contagion, or otherwise arising in the body. With regard to these, therefore, they have supposed that the cure of the disease arising from them was to be obtained by the correction and expulsion of the morbific matter; and the medicines suited to this purpose they have often given under the titles of *Alexipharmics* and *Alexiterials*.

How little foundation, however, there is for the greatest part of this theory, I have endeavoured to show in another place. See *First Lines of the Practice of Physic*. And whatever may become of my general doctrine, I cannot perceive that the medicines given under the titles of *Alexipharmics* and *Alexiterials*, are any ways peculiarly suited to expel morbific matter. In so far as they are any wise suited to that purpose, they are diaphoretics or sudorifics; and, as generally stimulant and heating medicines, they are to be employed with great caution. The terms of *Alexipharmic* and *Alexiterial* should therefore be expunged from the writings on the materia medica: for though the medicines enumerated under these titles may be truly useful, their being given under the false idea which the general terms imply, may induce an erroneous practice; and in former times they generally did establish that pernicious prac-

tice which cost Dr SYNDENHAM so much pains and trouble to correct.

ALEXITERIA. See the title of Alexipharmaca above.

ALLIOTICA, more commonly named ALTERANTIA, *Alteratives.* Medicines suited to change the condition of the mass of blood, particularly from a morbid to a sound state, and frequently employed for medicines suited not only to correct but to clear the blood from certain impurities supposed to remain in it. With what propriety, and in what sense, the term may be employed, we shall in the sequel have occasion fully to explain.

ALOEDARIA et ALOETICA, *Aloetics.* Compound medicines which receive aloes as a principal ingredient.

ALOEPHANGINA. Medicines formed by a combination of aloes and aromatics.

ALTERANTIA. See above Alliotica.

ALVIDUCA, *Openers of the Belly.* Medicines suited to promote the natural evacuation by stool, otherwise named LAXANTIA, *Laxatives.* The propriety of such terms, and the limits to be set to them, will be fully considered hereafter in our treatise on the materia medica, under the title of Cathartica.

AMBLOTICA. See above the title Abortiva.

ANACATHARTICA. Medicines purging upwards, and sometimes employed for emetics, sometimes for salivants, but most commonly implying, according to the original sense in which the term was employed by HIPPOCRATES, *Expectorants*, or medicines promoting the ejection of matter from the lungs, whether mucous or purulent. With what propriety and strict meaning the term may be employed, will be considered hereafter under the title of Expectorants.

ANALEPTICA, *Restoratives.* Medicines suited to restore the force of the body when lost, and sometimes employed with respect to stimulants, but more commonly with respect to those substances which supply a deficient nourishment. As a term, however, attended with some ambiguity, it should not be employed at all.

ANAMNESTICA. Medicines supposed to improve the memory, or to restore it when lost. A general title which seems to have no foundation at all, or although it had would, as too general, be very improperly employed. See Acoustics.

ANAPLEROTICA. Medicines supposed to supply the loss of substance in the whole, or in particular parts; as in wounds or ulcers. In the former case, it is improper, as of no defined operation; and

in the latter case, the surgeons know well how improperly such a general term is employed.

Anastomotica. A term of the same meaning with that of Aperientia; which see hereafter. When, however, the term of Anastomotica is especially employed, it implies medicines suited to open the extreme orifices of blood-vessels.

Anodyna, *Anodynes.* Medicines suited to relieve pain. It might be a general term, comprehending every means of relieving pain, and so far might be faulty; but as now generally employed for those means only which relieve pain by diminishing or destroying sensibility, it may be allowable.

Antacida, *Antacids.* Medicines suited to correct and neutralize acids. Of how many different kinds these are, and to which of them the term is properly applied, we shall endeavour to say hereafter in our treatise, in which the term again occurs.

Antacria, *Antacrids.* Medicines suited to correct acrimony, either in the whole system or in particular parts of it. To what medicines this title is properly applied, we shall say hereafter in the following treatise.

Antalkalina, *Antalkalines.* Medicines suited to correct alkaline salts, or alkaline matters in the whole body, or in particular parts. In what sense the term of Antalkalines may be properly employed, we shall explain hereafter under that title in the materia medica.

Antaphrodisiaca, or Antaphroditica. Medicines supposed to check or extinguish venereal desires. It is doubtful if there be any medicines of specific power for this purpose; and if there be remedies or medicines which have these effects, it is by answering particular indications, under the titles of which only they ought to be mentioned, and not under a general term of no defined operation.

Antasthmatics. Medicines supposed to cure asthma, or in general to relieve difficult breathing. With respect to this and all the other titles in which the word *anti*, connected with that of a particular disease or morbid function, is employed, the same observation is to be made that was made above under the title of Acoustic.

The meaning of the terms in which the word *anti* is employed may be commonly understood; but for the sake of the unlearned I shall repeat them here, with a short explanation of their meaning.

ANTEMETICA. Medicines suited to cure a preternatural vomiting.

ANTHELMINTICA, *Anthelmintics.* Medicines suited to poison worms in the alimentary canal, or to expel them from thence. As we cannot always distinguish whether our anthelmintics operate in the one way or in the other, and as several of them may be supposed to operate in both ways at the same time, the general term may for the most part be retained; though it is to be desired that we could distinguish between the proper anthelmintics and the violent purgatives.

ANTHYPOCHONDRIACA. Medicines suited to cure hypochondriasis.

ANTHYPNOICA. Medicines suited to dispel sleep.

ANTICAHECTICA. Medicines fitted to cure cachexy.

ANTICOLICA. Medicines suited to cure the colic.

ANTIDINICA. Medicines suited to cure giddiness.

ANTIDOTA, *Antidotes.* Medicines suited to oppose or destroy the power of poisons taken into the body. See above Alexipharmaca.

ANTIDYSENTERICA. Medicines suited to cure dysentery.

ANTIFEBRILIA. Medicines suited to cure fever.

ANTIHECTICA. Medicines suited to cure hectic fever.

ANTIHYSTERICA. Medicines suited to cure hysteria and hysteric diseases.

[* ANTILITHICA, or *Antilithics.* Medicines, whatever may be their modes of operation, which are suited to relieve the symptoms of a calculus, or of gravel, in the system of urinary organs. I also apply this term to those medicines which afford essential relief in the case of arthritic nephritis, the tendency of which is so often to lay the foundation of calculus. I propose to substitute the term Antilithia for the older and more commonly adopted term of Lithontriptica. The former phrase does not, like the latter, necessarily imply, that the antilithics break, or dissolve, the calculus; but merely that they so affect the urinary organs, as to prevent, in some instances, the formation of a calculus; that they may contribute to the excretion of such calculus when already formed; that they may change the increased acrimony, or other morbid condition of the urine, upon which the pains of nephritis calculosa sometimes depend; and, lastly, that they may, possibly, occasionally soften, and thereby contribute to the more easy removal of calculi along with the urinary discharge.—See LITHONTRIPTICA;—and the XXVth. class, ANTILITHICA, in the second volume of this work.*]

ANTILOIMICA. Medicines which preserve against the plague.

ANTILYSSUS. A medicine suited to cure the rabies canina in men or in brutes.

ANTINEPHRITICA. Medicines suited to cure the gravel, or other diseases of the kidneys.

ANTIPARALYTICA. Medicines suited to cure the palsy.

ANTIPHARMACA. Medicines suited to resist poisons.

ANTIPHLOGISTICA. Medicines or remedies suited to resist, diminish, or cure, inflammation, or an inflammatory state of the system.

ANTIPHTHISICA. Medicines suited to resist and cure phthisis or consumption.

ANTIPLEURITICA. Medicines suited to cure pleurisy.

ANTIPODAGRICA. Medicines suited to cure the gout.

ANTIPYRETICA. The same with Antifebrilia.

ANTIQUARTIUM. Medicines suited to cure quartan fever.

ANTISCOLICA. The same with Anthelmintica.

ANTISCORBUTICA. Medicines suited to cure scurvy; but frequently applied particularly to medicines of the class tetradynamia.

ANTISEPTICA. Medicines suited to resist or correct putrefaction.

ANTISPASMODICA. Medicines suited to cure spasmodic affections. A title certainly faulty as a general one; but it is difficult to reduce it to the particular operations comprehended under it. We shall, however, endeavour to do this afterwards.

ANTITOXICA. The same with Antipharmaca and Antidota.

ANTIVENEREA might be the same with Antaphrodisiaca; but for the most part it is only employed for medicines suited to cure the lues venerea, or some of its symptoms; and as too general, it is certainly improper.

APERIENTIA, *Aperients.* Medicines suited to open obstructed passages, and particularly to open and restore suppressed excretions or evacuations, and most commonly applied to medicines suited to open the vessels of the uterus, and thereby to excite the retained, or to restore the suppressed, menstrual flux. The term, therefore, as variously employed, both with respect to different cases and to different manners of operating, is, without specifying the particular case and operation, extremely improper. It has farther been too often employed with respect to certain medicines, whose power of answering the purpose proposed is extremely doubtful.

APHRODISIACA. Medicines supposed to be suited to excite the venereal appetite, or to increase the venereal powers. I do not know that there are any medicines of specific power for these purposes; and therefore the term seems to have been for the most part very improperly employed.

APOCRUSTICUM. The same with Repellent.

APOPHLEGMATIZONTA, APOPHLEGMATIZANTIA, and APOPHLEGMATICA. Medicines suited to excite the excretion of mucus from the schneiderian membrane, and they are of two kinds; as the evacuation is made from the nose, when they are named *Errhines;* or as the same is made from the mouth, when they are named *Masticatories.*

ARCHEALIA. Medicines supposed to be agreeable to the imaginary archeus in the system of VAN HELMONT, and is a term which has been adopted by the Stahlians upon the most imaginary and visionary footing, but it is not likely to be more heard of in the writings of physicians.

ARISTOLOCHICA. Medicines suited to promote the evacuation of the lochia in child-bearing women. The propriety of such a term will be considered hereafter under the title of Menagoga, in its proper place.

ARTERIACA. Medicines suited to relieve the diseases, or promote the functions, of the aspera arteria or trachea. A term conveying no precise meaning, and therefore improper.

ARTHRITICA. Medicines suited to cure the diseases of the joints, particularly the gout. It is a term of so vague and of so undetermined a meaning as to be altogether improper.

ASTRINGENTIA, *Astringents.* Medicines suited to increase the cohesion, and produce some contraction in the simple solids and moving fibres of the human body. Their manner of operating, and their effects, will be more fully considered hereafter in their proper place.

ATTENUANTIA, *Attenuants.* Medicines supposed to diminish the consistence of the animal fluids, either by dividing coherent masses, or by diminishing the size of the larger particles. With what propriety any medicines can be supposed to do this, will be considered hereafter: and I expect to show that the supposition is false, and the term therefore improper.

ATTRAHENTIA. Medicines supposed to draw the fluids in geater quantity than usual towards the part to which the medicine is applied. A power that may be fairly supposed in certain me-

dicines, but will be more properly expressed by a term pointing out the operation by which the medicine produces its effect.

B.

BASILICA. A quackish term applied to medicines supposed to be of noble or royal power; but as such terms are suited to deceive, and commonly have deceived the world, they are therefore unworthy of public societies.

BECHICA. Medicines suited to relieve a cough; which, as they may be of various kinds, the general term may mislead, and is therefore improper.

BEZOARTICA. Medicines supposed to have the virtues of bezoar, and chiefly those of expelling morbific matter. As these, however, supposed peculiar to that substance, were imaginary and ill founded, so the extension of the term to other substances or preparations is fallacious and improper.

C.

CALEFACIENTIA. Heating medicines, or those which increase the heat of the body. Whether there are any of this quality that act otherwise than by increasing the motion of the blood, and therefore by increasing the action of the heart and arteries, will be considered hereafter under the title of Stimulants.

CARDIACA, *Cordials.* Medicines suited to increase the action and vigour of the heart. This is the strict meaning of the term; but it has been extended to every means of increasing, and especially to those of suddenly increasing, the activity of the system; in which case the term may not have the necessary precision.

CATAGMATICA. Medicines suited to assist the reunion of fractured bones. A power which is not certainly known to exist in any medicine whatever, and therefore the term is falsely employed.

CATHÆRETICA. Medicines suited to cleanse foul ulcers; but as the operation of the different medicines employed for this purpose is not always the same, nor their different operation well explained, the propriety of the general term may be doubtful.

CATHARTICA. Medicines suited to increase the evacuation by stool. The various operation of these, and therefore the various application of the term, will be considered hereafter in its proper place.

CAUSTICA. Medicines suited to destroy the mixture and texture of animal substances. As a metaphorical term taken from the opera-

tion of actual fire, it is not strictly proper; but as now universally employed, it may still be allowed.

Cephalica. Medicines suited to relieve or cure the diseases of the head. However frequently employed, such a general meaning is enough to show the absolute impropriety of the term. It has been proposed to limit it to a more precise meaning, and to apply it to such medicines as have the power of increasing the energy of the brain, and the activity of the nervous system; but it has been applied in this manner without any proper distinction and precision; and till we can do this, the term would be better laid aside.

Cholagoga. Purgative medicines supposed to evacuate especially, or as the language is electively, bile; but as such a peculiar power in any medicine cannot be clearly ascertained, the term has been properly long ago laid aside.

Cicatrizantia, *Cicatrisers*. Medicines suited to induce a cicatrice, or new skin, upon wounds and ulcers. As it is extremely doubtful if such a power in any medicine exists, the propriety of the term may be justly questioned.

Consolidantia. Medicines suited to give firmness and union to growing parts in wounds and ulcers.

Cosmetica, *Cosmetics*. Medicines supposed to improve the beauty of the face, or to restore it when any how lost. The indication is to be answered by medicines of different, and even contrary, qualities; and therefore the general term is improper, and as such it has done much mischief.

D.

Demulcentia, *Demulcents*. Medicines suited to correct acrids, or to obviate the irritation arising, or that might arise, from them. What are the medicines that may answer this purpose we shall consider hereafter.

Deobstruentia, *Deobstruents*. Medicines suited to remove obstructions which have taken place in any of the vessels of the body. As a general term, it is improper; and as commonly employed for medicines which are supposed to remove the obstructions depending upon a matter filling up the vessels, it is commonly upon a false foundation, and therefore absolutely improper.

Deoppilantia, *Deobstruents*. Supposed to act in the manner last mentioned, and therefore upon a very doubtful foundation.

Depilatoria. Medicines suited to make the hair fall off from the places upon which it grows.

Depurantia. Medicines supposed to correct or evacuate the impurities which upon any occasion prevail in the body; but as no such specific power can be supposed in any particular medicine, the general term is groundless and extremely improper.

Diaphoretica. Medicines suited to excite or promote the insensible perspiration usually made from the skin. The term has been often employed for medicines suited to excite or promote sweat; and there are perhaps no exact limits to be put between the diaphoretica and sudorifera; or, so far as there is, the diaphoretica are employed for those medicines which promote the evacuation only in the insensible form.

Diapnoica. A term more strictly employed for medicines which act in the more gentle manner we have just now said of the diaphoretica.

Digerentia and Digestiva. Medicines supposed to promote the production of a proper, or, as the language commonly is, a laudable pus, in wounds and ulcers. There are certainly various medicines which seem to answer this purpose; but whether they directly contribute to this, or only correct those circumstances which impede the operation of nature, is a little uncertain; and therefore it is doubtful whether the general term be proper or necessary.

Diluentia, *Diluents.* Medicines which increase the fluidity of the blood, by increasing the proportion of fluid parts in it. This is the precise idea of diluents; and if the term is applied to substances, which by other means increase the fluidity of the blood, it seems to be very improperly employed.

Discutientia, *Discutients.* Medicines supposed to dispel tumour or hardness. The operation of such medicines seems to be of different kinds, and therefore the general term should, if possible, be avoided.

Diuretica. Medicines suited to promote or increase the secretion of urine. A term to be more fully considered hereafter.

E.

Ecbolica. A term of the same meaning with Abortiva.

Eccoprotica. Purging medicines of the gentler kind, or, strictly, medicines which promote the natural evacuation by stool.

Emetica. Medicines which excite vomiting. To what different substances the term may be applied, will be considered hereafter in our treatise on the materia medica.

Emollientia. Medicines which diminish the force of cohesion in our simple solids, and therefore soften and diminish the hardness and rigidity of the parts to which they are applied. Their manner of operating, and how far they operate on the moving fibres, is to be considered more fully hereafter.

Epispastica. Medicines which draw the fluids more copiously into the parts to which they are applied, and therefore strictly a term of the same meaning with that of attrahentia; but as the effect of the epispastica is commonly that of exciting blisters, the term is often employed for those of vesicantia and vesicatoria.

Epulotica. A term of the same meaning with that of Cicatrizantia.

Erodentia. Medicines which destroy the texture of our simple solid, and render a part of them therefore ready to be separated from the rest, in the manner to be hereafter more clearly explained.

Errhina. Medicines suited to promote the evacuation of mucus from the internal membrane of the nose. The term is to be more fully considered hereafter.

Escharotica. A term of the same meaning with that of Erodentia; or how far different, will be considered hereafter.

Evacuantia. Medicines suited to promote the natural excretions, or in any other way to draw fluids out of the body.

Expectorantia. Medicines suited to promote the excretion or rejection of mucus or pus from the lungs. What extent may be given to the meaning of this term, will be considered hereafter in its proper place.

F

Febrifuga. Medicines suited to prevent or cure fever. A term which, however properly it might have been formerly admitted, cannot now be employed but in a vague and undetermined meaning, and therefore most improperly.

G.

Galactophora. Medicines supposed to increase the production of milk in the human body, and to determine it more copiously to the breasts of females. As we cannot perceive that any medicines are possessed of such a quality, we must judge the term to be without foundation, and therefore improperly employed.

H.

Hepatica. Medicines supposed to be suited to cure the diseases of the liver; but as I do not know of any medicines which either can be particularly directed to that viscus, or which have any power of promoting the motion of the fluids in it, or which are possessed of any quality and specific power of promoting the secretion of bile, we judge the power of such medicines to be imaginary, and the term absolutely improper.

Humectantia. Medicines suited to moisten the solids of the body, and therefore of nearly the same meaning with Emollientia, as we shall explain more fully hereafter.

Hydragoga. Medicines supposed electively to carry off water by stool. What foundation there is for supposing any purgatives possessed of such a power, we shall consider hereafter under the title of Cathartica.

Hydrotica. A term of the same meaning with that of Sudorifica, or Sudorifera.

Hypnotica. Medicines capable of inducing sleep. Whether there are any medicines which have this power, but by a more general operation, and therefore to be marked by a more general term, we shall consider hereafter under the title of Sedatives.

I.

Immutantia. Of the same meaning with that of Alterantia.

Incidentia. Medicines supposed to divide, or as it were to cut through the particles of our fluids, or to separate any number of these particles preternaturally cohering together. A power of medicine which, as mechanical, I take to be quite imaginary, as we shall endeavour to prove hereafter when we shall consider the power of medicines acting upon the fluids.

[* Incitantia. This term is nearly synonymous with the term Stimulantia, when the last is properly applied. See Darwin's *Zoonomia*; &c. vol. ii. p. 427, &c. London: 1801.*]

Incrassantia. Medicines supposed to have a power of thickening the consistence of our fluids. How far there is a foundation for the use of such a term, or in what sense to be understood, we shall consider hereafter.

Indurantia. Medicines supposed to harden the solid parts. How far, or in what sense, such a power in medicines can be supposed, shall be said hereafter under the title of Astringents.

L.

Lactifuga. Medicines supposed to have the power of dispelling milk collected in the breasts of females. It cannot be readily admitted that any medicines have a specific power in this respect; and if there are any that can produce the effect, it must be by a more general operation, and by the terms adapted to that the vis lactifuga should be expressed.

Laxantia. A term that may be employed in the same sense with that of Emollientia; but the term is now more commonly employed for those medicines, Angl. *Laxatives*, which in a gentle manner promote the evacuation by stool.

Lenientia. Medicines suited to abate irritation and its effects, and particularly by correcting the quality of the irritating matter.

Lithonthriptica. Medicines supposed to dissolve stony concretions existing in the urinary passages. It is still, I think, a question, whether any medicine given by the mouth has such a power: and although I would not with any confidence determine against the possibility of such a power, I must acknowledge that I am very doubtful if there be any such; and I am certain that in most instances it has been falsely supposed by writers on the materia medica.

M.

Maturantia. Medicines supposed to favour the production and complete formation of pus in inflammatory tumours. There are certainly means which may be employed for favouring these operations of nature; but as it cannot be admitted that any medicines are endowed with any specific power to this purpose, the term as applied to medicines seems to be quite improper.

Melanagoga. Medicines supposed to have a power of electively carrying off *atrabilis* by stool. Though we should admit with the ancients and Dr Boerhaave, the existence of such an humour, we would refuse to admit such an elective quality in any purgative, and therefore the propriety of any such term; but the objection to this becomes much stronger when we can deny the existence of any such humour in the body.

Menagoga and Emmenagoga. Medicines suited to promote the menstrual flux in women, or to excite and restore it when retained or suppressed. We cannot absolutely deny such a power in medicine, and therefore the use of the term; but I would have it cautiously admitted, as I am of opinion that in a hundred in-

stances it has been employed without reason. More of this, however, hereafter, in its proper place.

MUNDIFICANTIA. Medicines suited to clean ulcers from any impurities adhering to them. The meaning of the term is nearly the same with that of detergentia and cathæretica, and the most general term is always the least proper.

N.

NEPHRITICA. Medicines suited to cure the diseases of the kidneys. A term, as too general, absolutely improper.

NERVINA. Medicines suited to relieve the diseases or correct the disorders of the nervous system. The obscurity that still attends the mode of the operation of medicines upon the nervous system, might excuse this term; but it seems to be more general than necessary, and we shall never get the better of the obscurity mentioned till more precision is attempted upon the subject.

NUTRIENTIA. Substances suited to be converted into the fluids and solids of the body.

O.

OBTUNDENTIA. Medicines suited to cover or blunt the acrimony of the fluids. With respect to the propriety of the term, see the article Demulcentia in our after treatise.

OBVOLVENTIA. The same with Obtundentia.

ODONTALGICA. Medicines suited to relieve the toothach. This and the three following terms, as too general, are absolutely improper.

ODONTICA. Medicines suited to relieve the diseases of the teeth.

OPHTHALMICA. Medicines adapted to the diseases of the eyes.

OTICA. Medicines suited to the diseases of the ears.

P.

PANCHYMAGOGA. Medicines suited to evacuate by stool humours of all kinds.

PAREGORICA. A term of the same meaning with that of Anodyna.

PECTORALIA. Medicines suited to the diseases of the breast. Employed in that general sense it is absolutely improper, and has certainly led to abuse. As it is at present commonly employed in the same sense as the term of Expectorantia, it perhaps might be allowed; but certainly the latter term, as more precise, ought to be

the one commonly made use of. If the Pectoralia may, with Mr Lieutaud, be of three kinds, Demulcentia, Astringentia, and Resolventia, it will be very obvious that the general term may be liable to much abuse.

Phagedænica. Of the same meaning with Erodentia.

Phlegmagoga. Medicines supposed to have an elective power of evacuating pituitous matter by stool. See above the title Cholagoga.

Pneumonica and Pulmonica. Medicines adapted to the diseases of the lungs. Terms which, like other vague and general ones, should certainly be avoided.

Psilothra. A term of the same meaning with Depilatoria.

Ptarmica. Of the same meaning with Errhina.

R.

Refrigerantia. Medicines suited to diminish the heat of the body. The propriety and precise meaning of the term will be considered hereafter in the article of Sedantia.

Repellentia, Repercutientia, and Reprimentia. Medicines suited to diminish the influx of the fluids into the parts to which the medicines are applied, or to drive backwards the fluids already in these parts. Terms, however, in whatever sense employed, too general, and therefore improper; but they will be considered more fully hereafter under the article of Astringents.

Resolventia. A term often employed in the same sense as that of Discutientia, for medicines suited to remove these external tumours supposed to depend upon obstruction; but so far as employed either externally or internally, they are supposed to have their effects by destroying the cohesion of concreted fluids. The term appears to be employed upon a very uncertain foundation.

Restaurantia. A term for medicines suited to restore lost strength; but commonly applied to those which restore that loss of strength depending upon the waste of fluids, and in that sense nearly the same with the term of Nutrientia; which see above.

Roborantia, *Strengtheners*. Medicines suited to strengthen the body, and therefore to restore the strength when it has been lost. As a general term it may be improper; but as it is commonly employed for medicines which increase the tone of the moving fibres, it may be allowable.

Rubefacientia. Medicines which applied to the skin produce a redness, and excite some degree of inflammation on it. See the

further consideration of this under the title of Stimulantia in the materia medica.

S.

SARCOTICA. Medicines suited to produce or to favour the growth of the flesh in wounds and ulcers. As the power of any medicine to this purpose is very doubtful, the propriety of the term must also be so.

SEDANTIA, *Sedatives*. Medicines suited to diminish the motions, and power of motion, in the body. What medicines may be comprehended under this title, will be considered hereafter in its proper place.

SIALAGOGA. Medicines suited to excite and increase the secretion of saliva. A title to be considered more fully hereafter.

[*SINAPISMATA, *Sinapisms*. Cataplasms, or external applications, which owe their chief activity to mustard, horse-radish, and other acrid plants of the class of *Tetradynamia*.*]

SISTENTIA. Medicines adapted to diminish or suppress increased evacuations. A term manifestly too general and improper.

SOMNIFERA and SOPORIFERA. Terms of the same meaning with that of Hypnotica.

SPLENETICA. Medicines supposed to relieve the diseases of the spleen. See our reflections upon the term hepatica, which are more certainly applicable here.

STERNUTATORIA. Medicines fitted to excite sneezing.

STIMULANTIA, *Stimulants*. Medicines fitted to excite the action of moving fibres, and in general the active powers of the system. A general term, admissible and necessary in our treatise on the materia medica, in which the various operation of such medicines is particularly explained.

STOMACHICA. Medicines suited to excite and strengthen the action of the stomach. I have been at a loss to determine how far this term, so frequently employed, could be properly rejected; but I am persuaded that it ought to be so, for the same reason as other too general terms.

SUPPURANTIA. A term employed with respect to inflammatory tumours in the same sense with that of Maturantia, and equally improper; but it is also employed with respect to wounds and ulcers, for medicines suited to produce pus in these: but as any specific power in medicines to this purpose can hardly be admitted, the term in this sense must be improper.

T.

Temperantia. A term of loose and uncertain meaning; sometimes used in the same sense as the term Refrigerantia, for medicines suited to diminish the heat, and thereby the activity, of the system; sometimes in the same sense as the term Demulcentia, for medicines suited to correct or cover the matters which give irritation; and sometimes, according to Mr Lieutaud, for medicines which carry noxious and irritating matters out of the body: but after thus observing that it may be employed with such different meanings, it cannot be doubted that this term is one of the most vague and improper general terms. Whoever reads the work of Mr Lieutaud will find, that the use of this term frequently occasions much ambiguity.

Theriaca. Medicines suited to resist or to obviate the effects of poisons from the bites of venomous animals. A term introduced by the ancients upon a very false supposition, and continued by the moderns upon no better grounds, in the same sense as the terms of Alexipharmaca and Alexiteria. But with the absurd compositions which have so long disgraced our pharmacopœias, and to which the term has been applied, the term itself should also be rejected.

Thoracica. Medicines adapted to the cure of the diseases of the thorax. A term as faulty and improper as the terms of Pectoralia and Pulmonica; upon which we have observed above.

Traumatica. Of the same meaning with the term Vulneraria; which see below.

Tyllotica. Of the same meaning with the term Catagmatica; which see above.

U.

Uterina. Medicines suited to cure the diseases of the uterus. A term much too general to be admitted.

Vulneraria. Medicines suited to favour and promote the cure of wounds. As the cure of wounds must be very entirely an operation of nature, the surgeon has hardly any other employment in this business, than to avoid or remove the circumstances which might impede the operation of nature. When such circumstances occur with respect to recent wounds, it is very doubtful if any internal medicines can be of use to obviate or remove them; and at least it is not probable that the medicines given under the title of Vulneraries can have any effect to this purpose. It is therefore that the surgeons of Britain omit entirely the employment of such

medicines; and it is surprising that foreign surgeons do still employ them, and the absurd compositions of them, which have been proposed. It is also surprising, that even late writers on the materia medica should so frequently continue the use of an indefinite and commonly ill founded term. It is indeed possible that the Peruvian bark, and other analagous substances, may in some cases be of use in mending the weakness of the system, and therefore the flaccidity of the parts affected; and perhaps in other cases some internal medicines may be of use; but they should be mentioned as answering a particular indication, and by no means under the indefinite term of Vulneraries.

Having now explained my terms, I think it proper to present a general view of the whole subject of my Treatise in the following Table; and to supersede repetitions, which might otherwise be afterwards necessary, it may be proper to give a methodical Catalogue of the particular aliments and medicines of which we are afterwards to treat. In both these parts of my work, it is for obvious reasons necessary to employ the appellations of the Latin language.

MATERIÆ MEDICÆ TABULA GENERALIS,

In qua Medicamenta ad Capita quædam secundum indicationes morborum curatorias quibus respondent, referuntur.

MATERIA MEDICA constat ex

- NUTRIMENTIS quæ sunt, P. I.
  - *Cibi*, Sect. I.
  - *Potus*, S. II.
  - et quæ cum his assumuntur *Condimenta*, S. III.
- MEDICAMENTIS quæ agunt in P. II.
  - Solida.
    - Simplicia.
      - *Astringentia*, Cap. I.
      - *Tonica*, C. II.
      - *Emollientia*, C. III.
      - *Erodentia*, C. IV.
    - Viva.
      - *Stimulantia*, C. V.
      - *Sedantia*, C. VI.
        - *Narcotica*,
        - *Refrigerantia*, C. VII.
      - *Antispasmodica*, C. VIII.
  - Fluida.
    - Immutantia.
      - Fluiditatem.
        - *Attenuantia*, C. IX.
        - *Inspissantia*, C. X.
      - Misturam.
        - Acrimoniam corrigentia.
          - In genere
            - *Demulcentia*, C. XI.
          - In specie
            - *Antacida*, C. XII.
            - *Antalkalina*, C. XIII.
            - *Antiseptica*, C. XIV.
    - Evacuantia.
      - *Errhina*, C. XV.
      - *Sialogoga*, C. XVI.
      - *Expectorantia*, C. XVII.
      - *Emetica*, C. XVIII.
      - *Cathartica*, C. XIX.
      - *Diuretica*, C. XX.
      - *Diaphoretica*, C. XXI.
      - *Menagoga*, C. XXII.
      - * *Anthelmintica*, C. XXIV. *
      - * *Antilithica?*, C. XXV. *

[* This Table, in the original work, is immediately followed by the "Catalogus rerum specialium," &c., which the Editor has found it more convenient, and in some measure necessary, to refer to the close of the present volume, immediately before the general Index to the two volumes.*]

A TREATISE

OF

THE MATERIA MEDICA.

HAVING thus finished all that seemed necessary by way of introduction, we now proceed to enter more directly upon our subject, and shall divide our work into two parts; the one treating of aliments, the other of medicines: The former being, as we have said, such substances as are suited to supply the matter, whether solid or fluid, of the human body: and the latter being such as have no such property, but are capable of variously changing the state of the body, and particularly of changing the state of disease into that of health. It is true indeed, that this last mentioned purpose may often be obtained by a certain management of alimentary matters, which thereby become medicines and subjects of the materia medica; and we shall have frequent occasion to view them in this light. But still it will be also proper to consider them separately; and we shall begin first with treating of the aliments.

PART I.

OF ALIMENTS.

CHAPTER I.

OF ALIMENTS IN GENERAL.

WE have already said, that aliments are those substances which taken into the body are fitted to afford and supply the fluid and solid matter of it. On this subject, it might be supposed at first sight that these aliments should be distinguished according as they are fitted to supply the matter of the solid or of the fluid parts; but upon further consideration, the marking of such a distinction will not be found necessary. It is sufficiently evident with respect to the alimentary matters taken into the body, that if they be in a solid state, they must, in order to their distribution and proper application, be by the powers of the animal œconomy converted into a fluid form: and as it is also obvious that this does constantly take place; so it will readily appear, that the matter fitted to form the solids, makes always a considerable portion of the fluids. It is the production of these last, therefore, that we are first to account for; and I expect that in doing this we shall be able to account also for the production of the matter suited to form the solids.

When we consider the whole of the fluids of the body, they appear to be of many different kinds; but we can particularly distinguish those that are pretty constantly in the course of the circulation, which we call the *common mass*, from those that are found in other vessels than those concerned in the circulation. These, however, being all of them, as we presume, drawn from the common mass, and therefore originally of the same matter, only somewhat changed by the secretory organs through which they pass; so we shall omit considering them any further here, and shall inquire at present only into the nature and production of that matter which forms the circulating or common mass.

To this purpose it is to be observed, that besides elementary water, which always makes the largest portion of the human fluids,

the next considerable part of the common mass is what we have named the gluten or coagulable lymph. This I consider as the chief part of the mass, because I suppose it to be that part of it which gives the matter of the solids, or the permanent constituent parts of the body, and which, from the beginning to the end of life, are constantly receiving a further accretion and increase. That the gluten is that part of the fluids which affords the matter of the solids, is sufficiently probable from this, that in all its qualities it very nearly resembles the solid matter of the body, while in any other part of the fluids there is no such resemblance. Therefore this gluten we hold to be the chief part of the fluids; and considering how much of it is diffused among the other fluids, and how much of it is dissolved in the serum or serosity, it is certainly, next to the water, the largest portion of the common mass. It may consequently be viewed as that into which the aliments, so far as they are nutritious, are converted, and therefore may be considered as the proper *animal fluid.* Under this title we shall hereafter speak of it; or to avoid all ambiguity, I shall frequently call it the *animal mixt.*

In order to account for the other matters that appear to be in the common mass, we must observe, that when this animal mixt is fully formed, it does not long remain stationary in that condition, but seems to be constantly, although perhaps slowly, proceeding to a putrid or putrescent state; as we know that if fresh aliment be not constantly supplied, the whole of the fluids will in no long time become very putrid. In this progress, as in other processes of putrefaction, we find the mild and perfectly neutral substance changed into a saline state of the ammoniacal kind; and this saline matter being washed off from the entire gluten by the water which constantly accompanies it, seems to form the *serosity* of the common mass. It is this again which nature, in order to prevent an undue accumulation of it, has provided for being carried out of the body by the several excretions, and that in the proportion necessary to preserve the health of the system.

We thus find that the portion of the common mass, which is termed the serosity, and which seems different from the gluten or animal mixt, is however formed from this, and does not therefore lead to suppose any other supply of alimentary matter than what is necessary to that.

To account for another portion of the common mass, we must remark, that the animal fluid is considerably different in its qualities from the vegetable matter of which it is often entirely formed, and that this vegetable matter, after it has been taken into the

body, is thus changed by the peculiar powers of the animal œconomy. This change, however, is only gradually and slowly made; and it is not completed till the aliments and chyle made of them are taken into the blood-vessels; and probably even in these, it requires some time to be finished. From hence we may perceive that a portion of the common mass is always for some time in an unassimilated state: and we have thus a view of the common mass as being made up of three several parts; the one being a portion of unassimilated matter, which is to be formed into the animal mixt; the second being the animal mixt completely formed; and the third being formed from that mixt in its progress towards putrefaction. Although, therefore, the matter may be seemingly different in its different states, we find nothing to lead us to doubt of its being always made of the same alimentary matter.

As it appears probable that the whole of the circulating or common mass consists very entirely of the matters just now mentioned, so we are disposed to conclude that a different kind of aliment is not necessary to form the fluids from that which is necessary to form the solid parts of the body.

In admitting this, however, a difficulty will occur from our observing that there is a portion of the common mass, and that also constantly, present in it, which is peculiarly different from the gluten in any of the states of it which we have mentioned. This portion of it is that of the *Red globules;* the formation of which from any state of the gluten, cannot, so far as I know, be explained; and it might therefore be supposed, that a peculiar kind of alimentary matter afforded this peculiar portion of the blood. It may possibly be so; but so far as I am acquainted with the subject, we do not know any part of the alimentary matters that seems adapted to this purpose: and as the red globules seem to be commonly in the same proportion to the gluten, and, the vigour of the constitution being given, that the quantity of both is in proportion to the quantity of the same kind of aliment taken in; so we may presume that the red globules, by certain powers of the animal œconomy, are made of the same aliment as the gluten. Again, therefore, I conclude, that there is no ground for supposing the aliment supplying the fluids of the common mass to be anywise different from that which is fitted for supplying the matter of the solids.

Another question, however, might still arise, which is, Whether any of the secreted fluids found out of the course of the circulation, but necessary to the animal œconomy, require an aliment

different from what is necessary to form the fluids of the common mass in the manner we have supposed? The negative of this we cannot indeed assert, but can justly say, that the affirmative is a gratuitous supposition without any proof. Indeed, while we can account for the production of the common mass from the aliments taken in, and at the same time pretty clearly perceive that the whole of the secreted fluids are drawn entirely from that mass, it will be with greater probability supposed, that the secreted fluids are, by the wonderful power of secretion, formed out of the common mass by a combination of the different states of that, or of different secretions, than that any of them are formed of peculiar aliments. Upon the whole, therefore, I again conclude, that the solids, and the whole of the fluids, are formed out of one and the same kind of aliment.

To ascertain exactly what that common aliment is, or if ascertained, to explain how it is adapted to its purpose, may perhaps go beyond our power; but in all such inquiries upon an analytical plan, it may be of great advantage to simplify the question as much as may be, and to begin at least with reducing the inquiry to the fewest questions possible.

Upon this plan, therefore, I enter upon the general question, What are the proper aliments of the human species? In answer to this, we know in general from experience, that the human aliments are taken entirely either from other animals, or from vegetables, and that no part of them excepting water is taken from the fossil kingdom. The substances employed are seemingly various; and in order to know the greater or less fitness of the individuals, it is requisite to consider in general how animal and vegetable matters are suited to give nourishment to the human body.

With respect to the former, the most part of the matter taken from animals are so nearly of the same qualities with the matter of the human body, that there is little difficulty in supposing that the animal matters taken into the human body, as aliments, are perfectly well suited to this purpose, and requiring only the means of solution and mixture, with very little change of their qualities. It is true, indeed, that in many of the animal substances we take in, the likeness of qualities to those of the human body is not always exact and complete; and we shall hereafter have occasion to take notice of this: but in the meanwhile, all of them agree so much in the qualities which chiefly characterise the human fluids, that we may presume on their being a matter so nearly the same, that the former may be very well suited to supply the latter.

To supersede, however, any further anxious inquiry upon this subject, we may remark it to be highly probable, that all animal matter is originally formed of vegetable; because all animals either feed directly and entirely on vegetables, or upon other animals that do so. From hence it is probable, that all animal substances may be traced to a vegetable origin; and therefore if we would inquire into the production of animal matter, we must first inquire in what manner vegetable matter may be converted into animal? And this question relates especially to the human body; the nourishment of which is in a great measure immediately taken from vegetables.

In attempting this, we shall find that the conversion mentioned is the effect of a peculiar power in the animal œconomy; which it must be acknowledged is by no means clearly or fully understood. We shall, however, make some steps towards understanding it better; and to this purpose there is one step absolutely necessary, which is, to determine amongst the seemingly great variety of vegetable matter, which is the kind that is especially, or perhaps only, fitted to be converted into animal? Or if this question, as thus put, be too general, it may then be to determine, what are the vegetable substances chiefly fitted for being converted into the substance of the human body? Nothing is more evident than that every vegetable, or every part of any one vegetable, is not suited to this last mentioned purpose; and therefore it is necessary, both for the sake of the general question, and also for the particular purpose of the materia medica, to determine as well as we are able what vegetables, and what part of them, are most fit for the nourishment of the human body.

In pursuing this inquiry, it is to be remarked, in the first place, that for the most part those vegetables are rejected from the list of aliments that are imbued with any strong odour or taste; and at least of the sapid, all except the acid and sweet are excluded. To this perhaps there are a few exceptions; as when the odorous or sapid part is in small proportion to the rest of the vegetable substance; when the odorous or sapid parts are such as pass quickly out of the body again by the excretions; or when they are such as admit of their qualities being entirely changed by the powers of digestion in the first passages. Such exceptions, however, hardly affect the general doctrine; which is very much confirmed by this, that several vegetables which in their acrid state are unfit or even noxious, by being deprived of their acrimony by culture, by blanching, by drying, or by boiling, are rendered quite proper: and if there

shall still be exceptions not to be accounted for in any of these ways, I would maintain, that such acrid substances are admitted and taken in as condiments rather than as nutriments.

This consideration of the exclusion of acrid matters from among our foods, is to be applied in this manner. As the acrid, odorous, or sapid parts, seem for the most part to be the peculiar matter of particular vegetables, and to be even but a small portion of these, seldom diffused over the whole, but deposited in certain parts of them only; and as this is more especially the case in those vegetables which are taken in as food; so we from thence conclude, that besides these peculiar matters, there is in the most part of vegetables a considerable quantity of matter, which, for reasons to be given hereafter, is manifestly in common to almost the whole of the vegetable kingdom. This we shall speak of as the common matter of vegetables, and having laid aside as above the peculiar, it is in the common matter that we are necessarily led to seek the vegetable substance that is suited to the nourishment of the human body.

Whilst from this consideration it appears that a great portion of vegetables is of an alimentary quality, at the same time it is from daily experience evident, that certain vegetables contain a greater portion of this alimentary matter than others, and that certain parts of vegetables contain more of it than other parts of them.

It is therefore further necessary to inquire after the particular substance of vegetables, or the particular parts of them that may be considered as the alimentary matter especially adapted to the human body.

In attempting this, it must, in the first place, be observed, that, contrary to what others have supposed, I cannot discern that any portion of matter is to be found existing in any vegetables directly fitted to supply the animal fluid. This, however, as we have already said, is seemingly, together with water, the foundation of all other fluids in animal bodies; and particularly, that from which the nutritious matter applied to the increase of the solid parts is, by the powers of the œconomy, formed and prepared. It is this animal fluid, therefore, that our vegetable food is to be converted into; and it seems to be a matter formed not from any one kind, but, by the powers of the animal œconomy, from various kinds of vegetable matter. Accordingly, when we are to say that certain parts of vegetables are alimentary, we mean only to say that they are matters fitted to enter into the composition of the proper animal fluid.

In studying this subject, it appears that the matter of vegetables,

whether in the whole or in the different parts of them, fitted to form the animal fluid, is an acid, a sugar, and an oil.

These three substances I shall now consider more particularly; and shall first endeavour to show that they truly enter into the composition of the animal fluid.

Article I. *Of Acid.*

That this is a part of the common matter of vegetables which proves alimentary will be readily admitted, because it appears in the whole substance of many of our vegetable foods, and particularly is frequently very copious in vegetable fruits. In these, indeed, it is commonly combined with more or less of sugar; but from what happens in the progress of the maturation of fruits, which is often the change of an acid into a saccharine matter, it is to be presumed that an acid enters largely into the composition of sugar, and is thereby, as will be shown hereafter, a necessary ingredient in the composition of animal fluid. It may perhaps be alleged, that it is only such an ingredient as being a part of sugar; but it seems probable that it is also such in its separate state. It seems indeed sufficiently proven, that every kind of vegetable aliment, except the purely oily, is capable of an acescent fermentation; and that every such aliment soon after it is taken into the stomach of an healthy person, undergoes such a fermentation; whereby an acid is always more or less evolved.* At the same

* It has been the opinion of many writers, besides Dr Cullen, that the vegetable food taken into the stomach, there undergoes an acescent or acetous fermentation; or, in other words, that the function of digestion is essentially dependent upon such a chemical change in the nature of our vegetable aliment. The experiments upon which this theory of digestion was founded, have been repeatedly reviewed, under a variety of aspects, by many able experimenters and physiologists; but particularly by the late Dr Bland of Virginia; by the Abbe Spallanzani, by Dr Fordyce, and by Mr John Hunter. These gentlemen have, I think, completely satisfied every candid physiologist, that the business of an *healthy* digestion, in the human stomach, is accomplished by a process totally unlike that of the acetous or any other species of fermentation. The experiments of Fordyce, in particular, are all important and conclusive on this subject. See a Treatise on Digestion, &c. London: 1791. So much I have thought proper to say; but I do not deem it necessary to pursue the subject any further.

The idea that an acid is the necessary result of the process of digestion, we see, led the professor of Edinburgh to entertain the notion, in a great measure peculiar to himself, that an acid "is a necessary ingredient in the composition of the animal fluid:" and on the same ground, we find him, in a future part

time it must be allowed, that as in the further progress of the aliment this acid disappears very entirely, without being ever again evident in the mass of blood ; so its having entered into the composition of the animal fluid can hardly be doubted : and if this appearance and disappearance of acid constantly takes place, we may I think conclude from it, that an acid, purely as such, is a necessary ingredient in the composition of the animal fluid.

The same thing appears likewise from this, that acescent substances are so far a necessary part of the human aliment, that without these the animal fluid advances much faster and further towards a putrid state ; and it appears more clearly still from this, that when the fluids have proceeded too far in their putrescency, so as to form a disease such as I take the scurvy to be, we know that this state is especially cured by the taking in of acescent aliment. It may perhaps be cured by every kind of such aliment; but still it is done most effectually by those in a very acid state, either produced by nature, as in lemons, or by vegetables converted by art into an acid state, as in sour kraut. In the use of these, as there is no evidence of their acting otherwise, they must certainly operate by entering into the composition of the animal fluid, and by rendering it of a less putrescent kind. It is upon the whole, therefore, extremely probable, that a vegetable acid in every shape is a proper and necessary part of the human aliment.

It is, however, proper to remark here, that this conclusion respects the native acid of vegetables only ; for we have reason to believe that the several fossil acids do not enter into the composition of the animal fluid, not only because they readily pass unchanged by the excretions, but because even in the circulation they continue separate from the other parts of the blood, so much as to irritate ulcers and issues ; and lastly because they do not cure the scurvy.*

of this work asserting, that iron in its metallic state is totally inactive in the stomach, except in so far as it there meets with an acid, or has been united with one, previously to its being received into the stomach.(*)

* I think there can be little doubt, that the fossil acids, if sufficiently *diluted*, will cure scurvy : and, indeed, I have in a case of this kind, which came under my care in the Pennsylvania Hospital, given the muriatic acid with advantage. That the fossil acids, " even in the circulation continue separate from the other parts of the blood," has not, I believe, been proved by any one. That they may irritate ulcers and issues, is highly probable : but I should think it more safe to suppose, that this irritation has been produced independently of any admission of the acid into the course of the circulation. No doubt, some difficulties at-

(*) See vol. 2, page 14.

How it may happen with respect to the phosphoric acid, the acid of borax, of amber, and some others, we do not very certainly know; but I am inclined to be of opinion, that all these just now mentioned are precisely in the condition of the fossil acids. It is to be suspected also, that it is the same with regard to certain acids that may be called vegetable; such as the acid of tartar, the distilled acid as it is obtained from tar, and even that it is so likewise with respect to the fermented acid or vinegar, when taken in large quantity. If the latter, as has been alleged, is found to increase coughing, it would show that it remains in a separate state, and thereby stimulates the bronchiæ; but it is likely that this happens only in consequence of its being taken in very large quantity: for it is very probable, from its being so largely employed in diet by a great part of mankind, that it enters even in large quantity into the composition of the animal fluid. Upon the whole, therefore, it would appear that the alimentary quality of acid is confined to the native acid of vegetables, as it is produced in them by nature, or as it is evolved from acescent vegetables, or from sugar in the stomach. Upon this occasion, what notice is to be taken of the aerial or mephitic acid, I am not well determined to say.

Article II. *Of Sugar.*

The second kind of vegetable matter which we have said may be supposed to be alimentary, is sugar. Whether this in its pure saline state, and taken by itself, without any mixture of oleaginous matter, can prove alimentary, seems to me very doubtful; but that even when approaching very nearly to a saline state, as it is in the sugar-cane, it may prove alimentary, is presumed from what happens to the negroes upon our sugar plantations, who are observed to grow plump and fat when, during the expression of the canes, they take a great deal of the cane-juice.

The same conclusion may be drawn likewise from this circumstance, that the people of warmer climates live very much upon fruits, whose substance in a great part consists of sugar; and I think it evidently appears that these fruits are more nourishing in proportion as they contain more of sugar. That sugar enters for a large share into the nourishment of men, we may know particularly from hence, that figs, a very saccharine fruit, were anciently the chief food of the Athletæ or public wrestlers.

tend this explanation; but, upon the whole, I think it more consentaneous to the vast multitude of facts which we possess concerning the influence of various medical agents upon the solids.

That the roots of these vegetables that are especially alimentary contain a great deal of sugar, we learn from Mr MARGRAAF's experiments, which show that a great deal of pure sugar may be extracted from them; and it can hardly be doubted that a great part of their nutritious power depends upon this ingredient in their composition.

The best proof, however, of the nutritious quality of sugar, or of its being a chief part of alimentary substances, is, that a great proportion of sugar is contained in all farinaceous matter. This appears from its being evolved in the most part of the farinaceous seeds by their germination or malting. And lastly, that all alimentary vegetables do for a great part consist of sugar, we may presume from their being universally liable to a vinous or acetous fermentation; the subject of which is probably in all cases a sugar.*

The affinity between saccharine and farinaceous matter appears particularly from this, that several fruits which at a certain period of their maturation are chiefly saccharine, are in their further progress often changed to a farinaceous state. The germination of seeds, therefore, and the maturation of certain fruits, fully prove the mutual convertibility of sugar and farina into one another.

While we thus endeavour to show that farinaceous substances contain a large proportion of saccharine matter, it is to be observed that the farinaceous seeds are of all other vegetable matters the most powerful and nourishing to men, as well as to domestic animals; and hence the *Farina Alibilis* of Dr HALLER. This nutritious quality he indeed imputes to a mucilaginous or gelatinous matter which appears in them upon their being diffused in water;

* The nutritious quality of sugar is well established by the experience of many individuals, who consume considerable quantities of this article. On this subject, in addition to the facts which we have long been in possession of, Baron HUMBOLDT has recently furnished us with some very interesting information. In order to obtain the nutritious and invigorating quality of sugar, it should always be used along with a small quantity of *farina*, or bread. The importance of this mixture is known to the American Indians, who, when they set out upon long journeys, during which they expect to experience a want of a proper supply of food obtained by the chase, &c., always provide themselves with a portion of the powder of maize, or Indian corn, mixed with honey.

Of the deleterious properties of sugar to certain species of animals, I have said a very few words in treating of ANTHELMINTICS, in our XXIVth chapter. The subject would be worthy of much more attention. I have also hinted at the inconveniences resulting from the large use of sugar in cases of diabetes mellitus. See vol. 2d., pages 283, 284.

and it is possible that their nutritious quality may in part depend upon this: but at the same time, from what we have just now said of the composition of farinaceous matter, it will appear that this vegetable mucilage or gelatina consists for a great part of sugar; which, therefore, may still be the basis of its alimentary part. We allow it, however, to be also probable, that farina consists of another matter, which may be supposed to give the whole its gelatinous appearance in solution, and probably also to render the whole a more proper, complete, and powerful nourishment to the human body. This other ingredient of farina is probably an oil of that mild and unctuous kind that is got from many farinaceous seeds by expression; and is therefore commonly named by the general title of an Expressed Oil.

Article III. *Of Oil.*

This leads us to consider what we suppose to be the other part of vegetable aliment. If farinaceous matters prove, as I have alleged, the most nourishing of vegetable aliments, it is equally evident that the most oily of vegetable seeds are the most nourishing of the farinacea; and from hence it will be sufficiently probable that oil, such as the expressed we have mentioned, makes a considerable part of our vegetable aliments.

Here, however, it may be imagined, that oil enters into the composition of the animal fluid only as it is a part of farina, or as it happens to be mixed by nature with other vegetable matter; and that, as it is taken in, whether from animals or vegetables in a separate state, it affords only the oily matter that is necessary to be constantly present in considerable quantity in the bodies of animals, not for their nourishment, but for certain other purposes of their œconomy.

We cannot, however, enter into this opinion: for we are persuaded, that even the oil which is taken into the body in the form of a pure oil, though entirely separate from other vegetable matter, does truly in a large proportion enter into the composition of the animal fluid; and that oil, therefore, may be considered in the strictest sense as a fundamental part of the human aliment.

We are of this persuasion, how much soever neglected by physiologists, from the following considerations.

1*st*, We observe that oil, both from vegetable and animal substances, is daily taken in as a part of diet by the people of all nations, and often in large quantity, without increasing obesity. It appears

likewise that this oil does not remain separate from the other fluids of the alimentary canal, but is very accurately diffused in the chyle; which may be considered as a step towards a more intimate mixture.

2dly, That such a mixture actually takes place is very probable from this, that no chyle appears in the left ventricle of the heart, nor in the arteries and veins which carry the blood which has passed through that ventricle. If there be some instances of such appearance, which have been alleged, they are certainly, however, very rare, and probably morbid.

3dly, Not only no chyle, but neither does any oil ever appear in any part of the mass of blood, nor ever in any part of the human body, till it appears in the cellular or adipose membrane, into which it is probably brought by a peculiar secretion. It has indeed been alleged, that oil has sometimes appeared on the surface of extravasated blood or serum; but in all such instances, we presume it to have been a preternatural appearance: For in the many hundred instances in which I have looked upon the human blood, I have never met with any appearance of that kind; and whilst oil is so constantly and copiously taken into the body, nothing can account for the absence of its appearance, but the supposition of its having undergone an intimate mixture of it with the other parts of the blood.

Some physiologists have been fond of finding the red globules of the blood to be an oily matter; and in certain conditions these may appear to be inflammable: but a fluid readily, equally, and permanently, diffusible in water, cannot be properly considered as an oil.

A *fourth* consideration that leads to suppose the oil taken in, to be intimately mixed with the other parts of the animal fluid, and to make a considerable part in the composition of it, is this, that the oil, which is often copiously laid up in the adipose membrane of healthy animals, is again, upon various occasions, absorbed and taken into the course of the circulation. Some of these occasions are manifestly those states in which a great degree of acrimony prevails in the mass of blood, as in scorbutic, siphylitic, hectic, and other such cases; and while it is highly probable that the purpose of such absorption is by the oil to cover the acrimony of the animal fluid, it must prove at the same time that this admits of an intimate mixture with the oil.

As the want of food is a principal occasion of the absorption mentioned, this affords a proof that such absorption is a means of supplying aliment, or at least of covering the acrimony which upon the

want of aliment is ready to take place. Upon either supposition, it affords a proof that oil unites very intimately with the other parts of the blood: and, upon the whole, there can be little doubt that oil taken in, either in its separate or united state, is a part, and a considerable part, of the human aliment.*

We have now endeavoured to determine that there are three kinds of vegetable matter which separately, or rather as united together, afford the proper aliment of man; and we are disposed to say there are no others: but it has been, and still may be, by many suspected that there is a fourth species of vegetable matter which should be taken into our account; and that is the mucilaginous part of vegetables.

It seems indeed to be very well ascertained, that gum Arabic, the most simple and pure mucilage, is an alimentary matter; and as a gelatinous matter is commonly supposed to be the form in which our nutritious juice is applied, it may be supposed that this mucilage of gum Arabic is to be considered as a simple substance, and in the same form directly applicable to the nourishment of the body. Perhaps it may be so; but many objections may be raised against the conclusion. At present it will be enough to say, that the gum mentioned is not a simple substance, but a compound of acid, sugar, and oil, and that thereby only it becomes nutritious.† In its powdery form it resembles farina; and a further analogy may be drawn from hence, that salep in its entire form resembles very exactly the gum, and in its powdery form comes still nearer to the appearance and properties of a farina. The conclusion of a similar nature in these substances will be still more readily admitted, when it is considered how nearly the amylaceous part of farina resembles the salep and gum in a powdered state; and it may be readily admitted, that the only difference between gum Arabic and farina

* The interesting facts which have come to our knowledge, concerning the torpid or soporose condition of many animals, belonging to almost all the known classes, furnish us with an additional argument in favour of the nutritious nature of oily matters. The Editor discusses this subject of animal torpidity at considerable length, in his lectures on materia medica, and in those on natural history.

† Chemistry has very satisfactorily shown us, that the gums, and among others gum Arabic, so far from being simple, are very compound substances. But a mere reference to any of the later books of chemistry will satisfy the student, that Dr Cullen's notion of the composition of gum Arabic is not to be depended upon. It must be confessed, however, that the chemical analogy between gums and saccharine matters is very close.

may be a little difference in the proportion of the several parts composing each. It may be supposed, therefore, that gum Arabic, and other such mucilaginous matters, may be like farina chiefly composed of sugar and oil, which the vegetable œconomy may combine in different proportions, and under different appearances, which we cannot either imitate or explain.

This further remark is to be added, that gum Arabic contains a portion of sugar seems probable from the experiment which shows, that an acid exactly resembling the acid of sugar may be extracted from the gum, by a process like to that which extracts the acid from sugar itself.

It is again, therefore, concluded, that the vegetable matters affording aliment are acid, sugar, and oil, which in diet may be taken in, sometimes in their separate state; but may also, as they are more commonly, and perhaps more properly, be taken in in a combined state; and in the latter case, either as they are combined in vegetable substances by nature, or as they are joined together by the cook in the preparations of diet.

Some time ago we should have rested in this conclusion; but the experiments of Beccaria, confirmed by Kesselmaier and many others, have discovered a substance in certain vegetables, which probably makes a part of the nourishment which they afford. Although this peculiar matter has hitherto been discovered almost only in wheat, it is probably also in some proportion present in the other farinacea; as these are all of them coagulable and nourishing, and many of them are nearly, if not as much, nutrient as wheat is. But however this may be, the discovery of Beccaria can amount to this only, that besides the parts we have assigned, there may be in certain vegetables a substance that makes a part of the aliment they afford; and justly indeed, as this newly discovered matter in its nature approaches more nearly to the nature of animal substance than any other part of vegetable matter we know of: but with all this we cannot find that this discovery invalidates our opinion of the chief part of the aliment afforded by vegetables being afforded by acid, sugar, and oil, to be compounded by the powers of the animal œconomy.

Besides the consideration of alimentary vegetables with respect to their constituent parts, there may be another general consideration of them proper here, and that is with respect to their being of different degrees of solubility in the human stomach.

What may be the power of the gastric menstruum, or the causes of its different power with respect to different substances, is not

well ascertained: but we now know that it is different in different animals, insomuch that in many carnivorous animals it has little power with respect to vegetable matters; and that in phytivorous animals it has little power with respect to animal substances.* See STEVENS *De Alimentorum Concoctione*, *Edinb.* 1777.

Although in the human stomach the gastric menstruum seems commonly to have power with respect to both animal and vegetable matters, it is, however, probable, that upon different occasions its power is in a different degree with respect to these different substances; as it seems at certain times to dissolve the one more readily than the other. What this depends upon, or under what different modifications it may appear, we cannot at present venture to determine.

At present it seems farther necessary to remark, that with respect to perhaps every human stomach, the powers of it in general being given, there is a difference in the solution of different substances, arising entirely from the different texture of these. Thus it appears, that apple and melon are less readily soluble than strawberries and raspberries; that full grown cabbage is less soluble than collyflower; and a like difference may be observed with respect to many other vegetable substances, as we shall hereafter take notice of more particularly. In the mean time it may, in illustration of the whole, be in general observed, that in many vegetables there is a different solubility in the different parts of them; so that in one and the same, while a certain part of them is entirely dissolved, another part of them passes off by stool in a very entire state. Thus, as many fruits consist of a tender pulp inclosed in a firmer membrane or husk, so the solubility of the whole will depend upon the proportion of these parts: and as in the maturation of fruits their pulp goes on increasing, while their membranes are constantly growing thinner and tenderer; so in many instances the solubility of fruits taken in an entire state will commonly be in proportion to their maturity.

In illustration of this subject of the solubility of aliments, it may be remarked, that in so far as the arts of cookery render the texture of aliments more tender, it renders them in proportion more soluble in the stomach.

* I am persuaded, however, from many circumstances, that this theory has been carried too far. We see the cat, naturally a carnivorous animal, brought to subsist, to a considerable degree, upon vegetable matters: and I know, that some species of sciurus may be brought to prefer animal to vegetable food. Even the eagle, by degrees, may be brought to support himself, in tolerable health, by vegetable matters.

At entering upon this subject, I should have observed, that we have a particular proof of the more ready or difficult solubility of different substances in the stomach. There are men who are occasionally, and many who are very frequently, liable to a rumination, or the bringing up by an eructation a part of the contents of the stomach. These parts are frequently somewhat entire portions of vegetable or animal matters, which are manifestly of a firmer texture than the rest which had been taken down, and have not therefore been so readily dissolved. From the rarefaction of their air not entirely extricated, they float near to the upper orifice of the stomach, and are therefore most readily brought up. I have known several persons liable to this rumination, and from them have learned, that certain substances are more commonly brought up than others, and some at a longer time after eating than others; and both circumstances seem clearly to depend upon the different degrees of solubility in these substances.

Having now finished the general consideration of alimentary matters, I proceed to the consideration of particulars.

CHAPTER II.

OF PARTICULAR ALIMENTS.

WE are to consider these under the separate titles of Meats and Drinks: and by the first we mean whatever, whether solid or liquid, may be considered as alimentary in the sense explained above; and by the second, what is especially, and almost only, fitted to give liquidity to the aliments, and supply the water necessary to the body. It is indeed true, that the liquids employed for that purpose may often also introduce nourishment; but under the title of Drinks, we shall consider the matter only as it affords a liquid.

The particular alimentary matters shall be considered under the two heads of Vegetable or Animal: but to these I shall subjoin the consideration of Condiments, which though not alimentary, yet, as always taken in along with these, and giving a particular modification of them, they will be most properly considered immediately after the consideration of the proper aliments themselves.

SECT. I.

OF VEGETABLE ALIMENTS.

THE nature of vegetable aliment in general I have already considered very fully; and am now to consider the particular vegetables or part of vegetables in which it is to be found: but in the whole of this, we are to mention these parts of diet only which are well known and commonly employed in Britain. We have arranged them, in the first place, as they are taken from the different parts of plants; and at the same time we have endeavoured, wherever we can, to mark the botanical affinities of the plants from whence they are taken. We have attempted also to arrange the several vegetable aliments according to the quantity of nourishment that each of them affords; beginning with those of the least, and proceeding to those which afford the greatest proportion of it: but in this respect we cannot execute our plan with any great degree of exactness and precision.

Having thus settled as well as I can the circumstances of order, we enter upon particulars; and first of the Fructus Horæi or Summer Fruits, or, as they may be properly named, the Acido-dulces.

A. a. *Fructus Acido-dulces, or Summer Fruits.*

THE particulars to be considered here are enumerated separately in the table given above; but they have all of them so many qualities in common with one another, that it will be proper to consider these common qualities first, and afterwards what may be peculiar to any of the particulars.

They are all of them useful in quenching thirst, which they do, partly by their cooling quality, and partly by their stimulating and drawing forth a liquid from the mucous excretories of the mouth and fauces. Taken down into the stomach, they have the same effect there; and sometimes further, by correcting putrescency, they remove a powerful cause of thirst.

In the stomach, our fruits give to the sensible parts a stimulus that excites appetite; and at the same time they prove refrigerant, and diminish the action of the sanguiferous system. This effect is from the stomach communicated to the rest of the system; and this, joined with their antiseptic power, renders them of the greatest utility in every kind of febrile disorder. Their power in this respect has been taken notice of by every writer on the subject; but whether they may be useful also in diminishing the tension of the

system in other cases, is not determined. VAN SWIETEN's observation of the effects of a large quantity of cherries in the cure of a maniac, and some other observations of the like effects of a large quantity of fruits, in certain melancholic cases, look like such a power. These effects, indeed, may be imputed to the constant diarrhœa which such large quantities of fresh fruits produce; but we are at the same time well persuaded of their general refrigerant and sedative power: and to this we ascribe their effects in the cases mentioned; in which opinion we are strongly confirmed by their power in producing dyspepsia and atonic gout. The same consideration also leads us to believe that in many cases they may favour the coming on of intermittent fevers, as GALEN has alleged. There may indeed be many instances of their being used without their having had that effect; but it will still be certain that fresh fruits often show a debilitating power, which may certainly favour the operation of marsh effluvia, in bringing on agues, and readily occasion a return of them when they had seemed to have ceased.

The effects hitherto mentioned depend especially upon the acid present in the composition of fruits, and which acid we have asserted above to enter in a certain proportion into the composition of the animal fluid. It therefore becomes necessary in the stomach; but it may be there in excess, may increase the acescent fermentation which happens there, and may thereby give occasion to the production of more acid than the other fluids of the stomach can properly involve. In this manner, therefore, they may give occasion to all the disorders of an excess of acidity in the stomach, which physicians are very well acquainted with.

The acidity taken in, or naturally produced, always subsists in a certain measure in the stomach; but carried into the intestines is there mixed with the bile, by which it is more entirely involved: and as we know that acid united with the bile takes off its bitterness, it is probable that acid fruits taken in are often useful in obviating the disorders that might arise from the redundancy of bile, and perhaps from the acrid quality of it. On the other hand, however, if the acids are in greater quantity than can be, or are, properly corrected by the bile present, they seem, by some union with that fluid, to acquire a purgative quality, that gives a diarrhœa, and the cholic pains that are ready to accompany the operation of every purgative.

From the involution of acids, which even happens in the stomach, and more completely in the duodenum, we must perceive that, as we have maintained above, they are mixed with the human fluids;

and the same also renders the other part of our doctrine probable, that they enter for a part into the composition of the proper animal fluid, to be thereby rendered less putrescent than it would otherwise be. Acids indeed are universally acknowledged to resist putrefaction; and hence the instinct of man leading him to the use of these fruits in warm climates, in warm seasons, and in every other circumstance that is known to increase a tendency to putrefaction. The state of the fluids in the scurvy may be disputed about; but the remarkable effects of vegetable acids and acescents in the cure of this disease do not allow us to doubt of their manner of operating, and therefore of the nature of the disease.

We have hitherto taken notice almost only of the acidity of the fruits we are considering; but that acidity is perhaps always accompanied with more or less of sugar; and thence perhaps more readily runs into a fermentation, by which their acidity, and all the effects of it mentioned, are greatly increased; and it is by the same fermentation that an unusual quantity of air is extricated, and gives occasion to that flatulency of the stomach and intestines with which the use of those fruits is so commonly accompanied. We often find, however, in fruits, the acidity accompanied with, or changed into, such a quantity of saccharine matter, that both from the reasons given above, and from universal experience, our saccharine fruits must be considered as particularly nutritive, and that also in proportion to the quantity of sugar they contain. In what manner sugar enters into the composition of the animal fluid, or how it acquires the qualities it puts on in these, I cannot very clearly explain; but we can have no doubt that it does so in fact: and we are well persuaded that the saccharine matter, as well as the acid, has a share not only in obviating the putrescency of the animal fluid, but also of correcting it when it has gone too far. It is therefore justly supposed, that the resisting putrefaction and curing the scurvy are virtues in common to the whole of the summer fruits we are treating of.

We have now mentioned the qualities that can be properly taken notice of as common to the whole of these fruits; but there are some others mentioned by writers on the subject. Thus those that are accompanied with an agreeable odour are said to be cordial and analeptic. Their powers, however, in these respects are too inconsiderable to be mentioned; but I dare not say so of the saponaceous and dissolving powers which are ascribed to them.

Upon this subject it is to be remarked, that the blood of phytivorous animals is perhaps more dense and cohesive than that of

the carnivorous; and therefore it is difficult to determine what is the effect of aliments in this matter: but I shall consider it more fully hereafter, when I shall consider in general how far the state of the fluids can be changed, either by aliments or medicines.

The qualities we have taken notice of in fruits have their effects chiefly in the first passages, even the changes they can produce in the mass of blood are all of them, if I mistake not, begun in the same first passages; and how far they have peculiar effects in the course of the circulation, I cannot well determine. We believe they have a tendency to increase the saline state of the blood; and therefore it is very possible that when they are taken in larger proportion than usual, they may show diuretic powers; but we judge that such appear only when fruits carry along with them a large proportion of water, as in the case of the *Water-melon.*

Having thus considered the qualities in common to the whole of the summer fruits, the peculiarities of each will be best explained by considering what happens to the most part of them in the progress of their growth and maturation. Thus, the most part of fruits, upon their first discovering any succulency, have that more or less acerb; but upon their succulency being advanced, there is more acidity evolved, and less acerbity is perceived. As the growth of fruits advances, if they are such as are capable of acquiring sweetness, this appears more and more, while the acerbity and acidity are constantly diminishing, and sometimes in their state of perfect maturity, a full and almost unmixed degree of sweetness prevails.

With these changes of their juices, it is to be remarked, that at the same time fruits suffer a change in their texture. At first they are firm and dense; but as their succulency advances, they are constantly becoming more soft and tender; and with their maturity they acquire the most succulent and tender state they are capable of. In the most part of fruits, we can distinguish between the softer pulp and firmer cortical part; and in the progress of their maturation, we find their pulp, in the innermost parts, constantly increasing, while the firmer and external cortical part is constantly diminishing. After fruits have in these respects of their juices and texture acquired their maturity, they suffer some further changes, to a farinaceous or to a putrid state, which I cannot explain; but as these changes hardly give any qualities to be taken notice of, either in diet or medicine, I shall not attempt to give any account of them.

Having now taken notice of the changes that may happen to

many individuals, the peculiarities that may take place in the several genera and species may be readily distinguished. Thus some fruits remain constantly in an acerb state, while others advance to a more pure acidity, hardly acquiring any sweetness. A third kind advances to a sweet state, still retaining more or less of their acidity; while others retaining little or none at all of this, acquire a full sweetness. Upon these circumstances, as they take place in particular fruits, both the diætetic qualities and medicinal powers of each may be ascertained by a little experience of the taste, in all the several states of growth and maturity they are capable of.

It is to be further observed, that the qualities of fruits as alimentary depend almost entirely upon the quantity of saccharine matter they can acquire, and this upon the greatest degree of maturity they can arrive at; so this will often depend upon the soil they grow in, and upon the climate and sun they have been exposed to. It is also to be remarked, that as the full evolution of their saccharine matter is the most perfect state of alimentary fruits; so whatever contributes to this, may be considered as giving them their utmost perfection: and therefore when in certain climates fruits cannot be allowed to remain upon their respective trees to acquire their due maturity, this, however, may be supplied: if fruits when taken from a tree can be preserved from frost, or other causes of corruption, the process of maturation still goes on, and will go on to a more perfect degree in evolving the saccharine matter, and in giving a greater tenderness of texture. This is not always to be promoted by external heat applied; but in some cases it may: and we find that certain fruits when taken from their trees, if laid in heaps, so as by a certain fermentation to become heated, they by this sweating, as it is called, lose their acerbity, and acquire more sweetness than they would have otherwise had; and it is to the purpose of diet to observe, that by the application of an artificial heat in boiling, baking, or roasting, acerb and unripe fruits have their saccharine matter much more evolved, and the effects of their unripe state very much prevented; particularly, as by these practices a great deal of their air is extricated and dissipated, they are less disposed to an acescent fermentation.

It belongs also to the business of diet to remark, that persons do often take in unripe fruits in considerable quantity; and much has been said of the danger attending such a practice; which is certainly in some measure well founded. The firmer texture of these unripe fruits is more difficultly dissolved, they remain therefore long in the stomach unmixed with the other fluids, and they are

therefore liable to acquire a greater degree of acidity, and to give all the disorders that may arise from that in too great an abundance. There are indeed stomachs whose gastric liquor may obviate all this; but certainly in many cases it may fail; and therefore the taking in of unripe fruits is always hazardous, and may be very hurtful.

We can hardly omit here saying what may perhaps be understood from what has been said already, that though fruits in their ripest, be at the same time in their most perfect, state, they may, however, even in this state, be taken in too large quantity; and in that case, being in over-proportion to the quantity or powers of the gastric liquor, they may go too far in an acescent fermentation, and give all the disorders that may arise from too acid fruits: and that this will especially happen from fruits which have still in their ripest state a large proportion of acid in their composition.

Having now said so much of the common qualities of summer fruits, I can have few observations to make on the qualities of particular kinds. These I have said will depend on the acerb, acid, or saccharine matter, in their constitution, whether that depends upon their specific nature or upon their state of maturation; and in all cases to be readily ascertained by experience in tasting.

For the sake of young students, we shall more particularly observe, that the *Drupaceæ*, or stone-fruits, have commonly a larger proportion of acid with respect to their sugar than some other fruits; and therefore in their recent state they are commonly and justly supposed to enter more readily into a noxious fermentation, and to produce those consequences of morbid acidity, colic, and diarrhœa, which we have mentioned above. This is especially, and perhaps justly, supposed with respect to the cherry and plum kind, and we believe may be equally supposed with respect to the peaches produced in the open air in Britain; but we are disposed to judge the apricot in these respects to be the safest of the drupaceous tribe.

The *Pomaceæ*, when duly ripened, or when their immaturity is corrected by artificial heat and proper additions, may have all the common qualities of other summer fruits; but in their recent state, being seldom duly ripened in this climate, the firmness of their texture renders them slowly dissolved, and ready to contribute to an excess of acidity in the stomach. This vice happens more readily with respect to Apples than to Pears, as we can at least

have some species of the latter more mellow and tender. In the case of a dyspeptic stomach, I have known apples a long time after they had been taken down, brought up again by eructation in the same masses they had been swallowed, and that even after two days.

Aurantium. This, with the Limonium, I have inserted here amongst the Pomaceæ, though not with strict propriety, as the fruit is not a pomum. But in this instance, I have followed the learned Professor Murray, who under the title of Pomaceæ has given not only the Poma, but also the Drupæ and Baccæ. How far this is proper I will not determine; but for my purpose of considering the diætetic qualities of fruits, I thought it fittest to distinguish their botanic affinities as far as I could: but I could not find a more proper place for the Aurantium and Limonium than that I have given them here.

Both these plants, in their leaves and flowers, and in the exterior cortical part of their fruit, have various medicinal qualities; which, according to my plan, are not to be mentioned here; where I am to consider only the qualities of the juice of their fruits, the only part of them employed in diet.

The juices of these fruits we consider as purely acid, to be more easily collected in large quantity than from almost any other fruit; and therefore they are more frequently than that of any other employed. Wherever an acid is indicated and admissible, they answer every purpose which we have proposed above for acids in general, whether in the mouth and fauces, or in the stomach and intestines. They certainly enter into the composition of the animal fluid; and accordingly much experience has pointed them out as the most useful both in preventing and curing the scurvy.

They are of two kinds. One in which they are more purely acid, with very little saccharine matter joined to them: the other is that in which a considerable portion of sugar is joined with the acid; by which it may be considered as in some measure nutritive. This, however, is little attended to; and they are seldom employed as a nutriment. This only is to be remarked, that the China or *Sweet Orange* has, in a certain degree, every quality that can be ascribed to any of the fructus acidodulces.

These are the virtues of these acids: but it must be observed, that wherever acids can be hurtful, these either in undue quantity, or in dyspeptic stomachs, are as readily noxious as any other.

On the whole of the subject, I have only further to observe, that as the fruits mentioned are the fruits of a season, it is often neces-

sary to preserve their juice in its entire acid state for some length of time; and for this purpose various measures have been proposed. What may be done by congelation I cannot determine, as it is very rarely that this climate allows of the experiment. The practice by evaporation, or the making it into a rob, has been that most commonly employed, and has been much commended by many persons; but in many trials which I have made, I could not exhale it to such a consistence as would preserve it without addition, without my finding the acid a good deal changed. It acquires an acerbity and stypticity that does not allow it to be readily diffused in water; and I suspect it is not so readily miscible with the animal fluids as in its entire state. From FORSTER's observations in the voyage round the world, it was not found useful either in preventing or curing the scurvy; which perhaps may be accounted for, partly by the concentration bringing it nearer to the state of the fossil acids, or possibly by the dissipation of some volatile parts, perhaps a portion of aerial acid; both of which circumstances may render it less fit for the cure of the scurvy. I have therefore a bad opinion of the acid exhaled to a thick consistence; and judge the best way of preserving its virtues to be by a diligent depuration of it from its mucilaginous part, and putting it up in close vessels without putting any oil on its surface, which is ready to be acted upon by the acid, and gives a disagreeable taint to it.

What in our catalogue are put under the title of *Senticosæ*, as their tender substance is easily dissolved, and that in their ripe state they do not exceed in acidity, are justly reckoned the safest of summer fruits. If the large annual use of STRAWBERRIES could preserve from the gout, we should seldom find the inhabitants of Edinburgh affected with that disease; but though they use that supposed preservative very largely, we find them as often and as severely affected with the gout as the inhabitants of other places who do not use the same. Under the title of Senticosæ I had formerly set down the CYNOSBATOS, as it still retains a place in some dispensatories; but after much attention, I cannot find that the best kinds of this various fruit possess any peculiar qualities that should introduce them either into diet or medicine.

Of the *Ribesia* there is a considerable difference between the RIBESIA, strictly so called, or currant, and the GROSSULARIA or gooseberry. The former has always a large proportion of acid; and though it should be more sweet, as the smallness of the berry does not easily allow it to be taken without the husk, it is a less safe fruit: whereas the glossularia, as commonly containing a larger

proportion of sugar, and as it may be easily taken without the husk, affords a safer, and generally a very safe, fruit. To the RIBES NIGRUM, some singular virtues have been ascribed; for which, upon repeated trials, I have not found any foundation.

The Vaccinia duly ripened, though retaining a good deal of acidity, are commonly easily digested; but the most agreeable species, the oxycoccus or craneberry, is still safer in its preserved than in its recent state.*

UVÆ VITIS.

Every body knows that the Grape, according to somewhat specific in the nature of particular kinds, according to the soil it has grown in, the sun it has been exposed to, and its different degrees of maturation, is in very various condition; and the qualities therefore of it in its different states are to be judged of by the principles laid down above: But I think we may assert, that Grapes which contain a large proportion of sugar, are, if taken without their husks, the safest and most nutritive of summer fruits.†

Of the fruits hitherto mentioned, except the vaccinia, I have considered them only as in their recent state; but it is proper to take notice of them also, as they are often used in a dried state. In this state their watery part, and perhaps their acid and air, is in part abstracted; and therefore their powers are in a more concentrated and perhaps improved state.

Of these dried fruits, the PRUNES, as they contain a great deal of the acid they originally had, are more of a laxative quality than the other dried fruits. Sugar, and therefore saccharine fruits, have all of them somewhat of the same quality; but we are persuaded that the laxative quality of fruits is commonly to be attributed to their acid conjoined with the bile, as above alleged.

* Some of the North-American species of vaccinium contain a considerable quantity of saccharine matter, and are very delicate as well as nutritious articles of diet. When well dried, they are mixed with a portion of the meal of Indian corn, and are frequently made into bread by certain Indian nations; and this bread has received the name of "Whortle-berry-bread." The cranberry of the United-States is not very essentially different from that of the old continent, though its fruit is considerably larger.

† This is a matter about which all persons will not be equally agreed. The grape is, unquestionably, a noble fruit: but I suspect that a majority of any given number of persons would prefer the strawberry to it. I will not pretend to determine what may be the comparative proportion of nutriment in the two fruits: but I strongly suspect, that to persons of delicate constitutions, the strawberry will, in general, be found the safest fruit.

[*Different species of DIOSPYROS, or Persimmon, might be mentioned here. The common persimmon of North-America (diospyros virginiana), when its astringency has been considerably subdued by the influence of the frosts, is a nutritious fruit. In the more southern parts of the United-States, it has much less of astringency in its composition, and here it is made into bread by many Indian tribes.*]

Of the PASSULÆ MAJORES or raisins, as very purely saccharine, they may be considered as considerably nutritive, and that in proportion as they are more entirely saccharine.

The UVÆ APYRENÆ, or corinthiacæ, otherwise named Passulæ minores, as having more of acid, are therefore with the nutritive quality of the raisin more laxative.

The DATE of the best kinds is a very saccharine fruit, and their nutritious quality is well ascertained by the experience of many people who live upon them very entirely. These which come to us have, besides their nutritive, no peculiar quality of astringent or demulcent that I can perceive.

DRIED FIGS are a fruit containing a large proportion of sugar; and by the experience of many people, considerably nourishing. They are perhaps more so, that their sugar is united with a large portion of a mucilaginous matter, which we always suppose to be of an oily nature, and therefore contributing to a nutritious quality. The mucilaginous nature of Figs has given occasion to their being considered as demulcent; and both these and the dates have been much employed in pectoral decoctions, and for moderating the acrimony of the urine in nephritic cases; but we shall hereafter show, that the power of demulcents, both in these and other substances, is a very doubtful matter. In the mean time, we are clear that the materia medica has lost nothing by our dispensatories omitting the SEBESTEN and JUJUBES, dried fruits, somewhat of the same nature with the dates and figs, and formerly used for the same purposes.

To the consideration of the dried fruits, it is proper to subjoin the consideration of fruits in their preserved state; which is commonly done by means of some boiling, and by afterwards adding to them a quantity of sugar. In this state they preserve sometimes their acid, and always their acescent and nutritive qualities; but both by the boiling employed, and the sugar added, they are perhaps less liable to acescency; and by the latter circumstance their nutritive qualities are certainly increased.

Some fruits are preserved by being laid in brandy, or other

ardent spirit; but this hardly preserves in them any of their original qualities. Their acescency is entirely destroyed; and they are rendered absolutely unfit to be employed as nutrients.

To conclude the subject of fruits, we shall consider a question which has been frequently stated, and that is, Whether recent fruits are most safely and usefully taken before or after a meal or the use of other food? The answer seems to be very obvious. In dyspeptic stomachs, or these which do not easily or powerfully overcome acescency, the taking in of acescents must be less safe before a meal than after it. In the case of stomachs powerful in the digestion of acescents, these may be commonly taken safely before meals, and possibly often with advantage, as they may excite appetite and favour digestion. In the most part of stomachs, fruits in moderate quantity are safe after meals; and when these have consisted of much animal food, the use of fruits is generally proper, though in certain dyspeptics the large use of them may not be always safe. The use of the dried fruits is certainly safer than that of the recent before meals; but even the dried fruits cannot be taken in that condition with sufficient safety by the dyspeptic. As I am well persuaded of the nutritious quality of dried figs, I can hardly believe, with LINNÆUS, *Amæn. I.* 136. that a large quantity of these can be taken before a meal without any diminution, and rather with an increase, of appetite.

With respect to the use of fruits, there is still a question to be mentioned. In many countries, particularly in Britain, both recent, boiled, and preserved fruits, are often taken with milk: and this practice has been condemned by SPIELMANN; but as I judge without reason. In this country, the practice is almost universal, without our observing any mischief arising from it. Such experience is the most secure foundation for concluding that the practice is not hurtful; but it may be further added, that the supposition of the consequences arising from it is not well founded. It is supposed they may arise from the coagulation of the milk in the stomach: but this happens to perhaps every portion of milk taken down into it; and therefore certainly happens for the most part without any bad consequence. Further, however, we judge the milk may be useful by involving a portion of the acid, as it has been often found to be a cure for heartburn. If it happens, as commonly, that the oily part of milk is employed, it is probable that the coagulum will not be very firm, and also that the acid will be more properly and fully involved. As we are persuaded that the animal fluid is always formed of acid, sugar, and oil, so I judge

the mixture of these in diet to be not only allowable, but very proper; and therefore that cream with strawberries, and butter with apple-pye, make a very proper diet.

Before going further, it is to be remarked, that in treating of the above alimentary substances, we have not followed the method of other writers on the materia medica, who upon the occasion of mentioning substances as alimentary, do at the same time mention the medical virtues of the other parts of the vegetable from whence the alimentary matters are taken. This, however, appears to be distracting the student's attention; and we have avoided it, resolving in another, and as we judge a more proper place, to take notice of the medicinal qualities that may be in the whole, or in the parts, of alimentary vegetables; and shall now, therefore, in considering the rest of the alimentary substances, keep to this measure.

After the fructus acido-dulces, the next set of vegetable aliments to be mentioned, are the fruits of the *Cucurbitaceæ.* This order, as we observed above, by no means shows the power of botanical affinity in giving the same medical virtues to every fruit of the same order; but these in our list, which are the chief of the alimentary substances taken from this order, are of a very similar nature with one another. They are not supposed to be very nourishing; but may be truly more so than is imagined: for though in the state in which they are employed, their sensible qualities do not promise much, I judge their substance to be of the nature of the farinacea, which are to be hereafter mentioned as the chief of vegetable aliments.*

All of the *Cucurbitaceæ*, by a certain maturation, are changed into a farinaceous substance; and Scopoli informs us, that the substance of the pompion is employed by some people in the making of bread; and that one part of that substance, with two parts of wheat-meal, may be employed for that purpose.

The Cucumber, as commonly employed in its unripe state, is perhaps in that condition not very nutrient; but it is so much so as to make a considerable part of the aliment of many persons in warm climates and seasons: and its aqueous, cooling, and acescent quality, render it a very proper summer aliment. The firmness, however, of its texture, occasions it often to be long retained in the stomach: whence it frequently occasions acidity and flatulency, and is therefore properly accompanied with some of the condimenta.

* Certain American tribes derive not a little of their vegetable aliment, during the winter-season, from the dried pulpy matter of some of the cucurbitaceæ.

The MELON in its ripe state discovers some sweetness, and may therefore be more nourishing. On the same account, however, it comes nearer to the qualities of the fermentable fructus acido-dulces: and as at the same time, from the firmness of its texture, it may often show the effects of too great acescency, moderation is necessary in its use, especially by dyspeptic persons; and I think it is commonly rendered safer by the addition of sugar and aromatics. Some writers have mentioned its diuretic effects; but I cannot find these from the Melon to be more than from other aqueous food. If SANCTORIUS found Melons to diminish perspiration, they might thereby indeed increase urine, as he also observed; but all this I would impute to their refrigerant rather than to their directly diuretic powers. I have found no evidence of Melons stimulating the kidneys; and the account given by Dr ARBUTHNOT of their giving bloody urine, is a single fact, and seems to be extravagant.

[* The water-melon contains a large quantity of saccharine matter in its composition, and may, undoubtedly, be considerably nutritious. To many persons, it is an extremely agreeable article of diet: but I think it often occasions, in delicate constitutions, some inconvenience to the stomach. This I have often experienced in my own person: and others have informed me of the same effect. It has often been asserted, that the water-melon proves diuretic: and, indeed, it is difficult to oppose the testimony of persons on this head. Is it otherwise diuretic, except in so far as it is a very saccharine fruit? I believe it is a fact, that the quantity of saccharine matter, in this beautiful fruit, increases in a pretty regular ratio to the heat of the climate.*]

B. FOLIA *et* CAULES PLANTARUM.

OF the leaves and stalks of plants used as aliments, I have set down only a few, as of these kinds of plants few afford much nutriment; and in the list of nutrients given by writers, I find many of them which, both from their qualities and from the quantities in which they are employed, cannot be considered as nutrients so properly as condiments; and to that place I refer them.

Of the nutrients, I have set down a few under the title of *Oleraceæ;* having in view their botanical distinction, rather than the meaning of the term Olera as formerly employed.

Of the leaves mentioned, and several others that might have been added to the list, they are all of them mild and almost insipid substances, with hardly any sweet or mucilaginous taste to discover a nourishing quality; but they are acescent and ferment-

able, and therefore must contain some portion of sugar. They contain, however, so little, that they are justly supposed to be among the weakest nutriments. For the table, they are properly chosen by the tenderness of their texture; and therefore the SPINAGE is justly preferred, and is now almost the only one of these oleraceæ employed.

If the plant to which we give the name of MALVA is the same to which the ancients gave that appellation, I think they made a bad choice in employing it as one of the olera; for it has hardly more mucilage than the spinage, and cannot by any boiling be brought to be so tender.

The oleraceæ are commonly said to be laxative; but they are no more so than any other vegetables capable of fermenting in the stomach, and that are taken into it in large quantity.

After the oleraceæ I have set down the BRASSICA, which, though I have distinguished it by its botanical order, is one of those which have been commonly named Olera, and is one of these which were anciently, and is still at present, in the most frequent use. I have marked it as one of the *Siliquosæ*, for the sake of observing, in proof of our general doctrine of vegetable aliments being those most free from acrimony, that the brassica is the most free from that peculiar acrimony which distinguishes all the other plants of the class of *Tetradynamia*. It is accordingly the only plant of the class whose leaves are employed as nutriments; and this circumstance of the mildness, fulness, and considerable sweetness of its juice, with the bulk in which it is produced, will readily show why it has been at all times so much employed as an aliment.

One species of the brassica, designed by the trivial name of *Brassica Oleracea*, is supposed by culture and other circumstances to have been brought to be of many varieties which put on very various appearances, and all of which, for the purposes of the table, are cultivated in most of the countries of Europe. Whether the plants under these different appearances are different species, or varieties of one species only, I leave to be determined by the botanists; and whether they be of the one kind or other, I leave the more nice and accurate distinction of them to the men of that science: I am to speak only of these I am well acquainted with, and whose distinction I believe to be very commonly known and universally established over Europe.

In all the varieties of the *Brassica Oleracea*, I take the alimentary qualities to be very much the same. It is indeed possible they may differ in the quantity of it which they severally afford; but

this I have not been able to ascertain with any precision. As all of them may be considered as a supplemental provision only, I believe they are seldom to be chosen by the quantity of nourishment they afford; and I think they are to be chosen as a part of diet by the tenderness of their texture, and by the fulness and sweetness of their juice. It is probable that on many occasions they are chosen by the bulk in which they may be produced, and by the facility with which they may be reared and preserved in certain soils and climates.

Upon the first ground, the COLLYFLOWER and BROCCOLI are to be chosen, as the most tender, most easily digested, and least flatulent,

Of all those kinds of which the leaves are especially employed, the BRASSICA SABAUDA, or *Savoy*, appears to me to be sweeter and more tender than any of the others I am acquainted with; and in the Savoy, I hold the central and upper leaves gathered pretty closely together, to be by much the tenderest portion of the whole plant.

Those kinds of the Brassica, whose leaves, after a certain time of their growth, are gathered in greater quantity, and more closely, into a firm and globular head, are named *Brassicæ Capitatæ*, or CABBAGE, affording the greatest bulk of product, and perhaps the greatest quantity of nourishment.

As all the Brassicæ seem in a pretty firm texture, and in a very fermentable juice to contain a great quantity of air, they are all noted for producing flatulency in the bowels. As the younger plants are the most tender, so they are the least flatulent; and as the formation of cabbage requires a longer time in growing, so cabbage acquires a firmer texture, and is noted for producing more acescency and flatulency than any other kind. Cabbages are by their colour distinguished into two kinds, the *white* and the *red;* and the latter is found to be of the sweeter and tenderer kind.

Since I first wrote the above, I have become acquainted with a species of Brassica that I was not acquainted with before. This is what has been called the *Brassica Gongylodes*, which, till I raised it in my own garden, was not, so far as I can learn, known or produced in Britain. It is distinguished by its having on the upper part of its stalk a swelled part, or spheroidical tuber, which within a firm cortical part is formed of a substance of the same nature with that which forms the medullary part in the stalks of cabbage and other kinds of colewort. This medullary part, when

freed from its rind, and very well boiled, is of a tender and sweet substance, and certainly is considerably nourishing, and appears to me to be less flatulent than the cabbage. It is firmer in its consistence, and sweeter than the turnip; and though the hardness of its bark may render it unfit to be reared for the purpose of feeding cattle, I am of opinion, that under proper management it may afford a delicacy for the tables of men.

I have thus given the choice of the several species of the Brassica, so far as I am acquainted with them; and believe the principles I have made use of will apply to every other species, when their nature and different states are properly known.

We have only to remark further, that as we have said just now, that the whole of the species contain a great deal of air, they may be rendered fitter for diet by having a great deal of that air extricated and dissipated before they are employed in food.

This gives us an opportunity of observing, that our vegetable aliment of all kinds contains a great deal of air, which disposes them more to acescency and flatulency; and which they are more disposed to produce as they are of a firmer texture, or as they are further advanced in their growth. The extrication, therefore, of a great deal of this air before they are taken into the stomach, is always of great service in obviating the tendency mentioned. We have mentioned this particularly on the occasion of cabbage, so frequently accused of acescency and flatulency, but which may, by very long boiling, be rendered almost as safe as the tenderest vegetable. For the most part it may be rendered as safe as colly-flower, to which our cooks, for the sake of the figure it is to make upon the table, seldom give the boiling that is necessary to render it duly digestible.

Besides the boiling mentioned, there seems to be another means of extricating the air of cabbage, by subjecting it to a fermentation, as in the preparation of Sauer Kraut; a preparation so named in Germany, where for many ages past it has been a common part of diet.

This preparation has now been described in several books which are in every body's hands, and therefore need not be repeated here; and in this place it seems only to be necessary to say what are its qualities. As the matter has been subjected to an active fermentation, so a great deal of acid is evolved in it; and after what we have said above of acid as an alimentary matter, it will be readily allowed that Sauer kraut may be considered as such. But as the whole of the matter is not thus converted, but that a great

portion of the saccharine matter of the cabbage still remains in it, so it will be still more readily allowed that this preparation may be considered as alimentary, and well suited to the purposes to which it has been especially applied, that is, the obviating and curing the scurvy.

Another set of the leaves, or rather stalks, of vegetables, which are considered as alimentary, are set down in our catalogue under the title of the *Semiflosculosæ*, to which order they belong. They are lactescent plants; and like the whole, or at least most part, of that kind, have a considerable acrimony in their juices. These here pointed out are indeed less acrid than most other lactescents; but even of these here mentioned, it is still the LACTUCA or *Lettuce* that is most commonly employed, as having in the species of it employed the least of that acrimony that is peculiar to the order, and especially at the early period of its growth at which it is taken. In this state, it hardly discovers any thing sweet or mucilaginous in its juice, and therefore may be supposed to give little nourishment, especially in the raw state in which it is commonly taken; but when boiled, it proves more sweet and mucilaginous, and therefore may be supposed to go further as a nutriment. Even in its raw state, as acescent and refrigerant, it is properly enough combined with animal food; but upon the same account in most persons it requires the condiments that are usually taken along with it.

Of the other *Semiflosculosæ*, the *Succory* and *Endive*, especially the latter, make frequently a part of our food; but they are hardly ever taken while they contain their peculiar acrid juices, and only when by the arts of blanching they are deprived of these. But even their blanched parts are left in possession of the juice in common to vegetables; which, as we have said above, is always of a fermentable nature, and therefore consists of a saccharine and nutritious matter.

I have to say the same things of the *Taraxacum* or Dandelion. Whatever medical virtues in its natural state this may be possessed of, which for the reasons given above I do not inquire after here, it can only be employed as a part of aliment when deprived of those medicinal qualities. It is in this state only as it first arises out of the earth, and more especially when its first shoots are become of some length, by their rising out of mole-hills or other loose earth.

After the *Semiflosculosæ* which are chiefly employed in a blanched state, I have set down the *Umbellatæ*, for the sake of intro-

ducing a frequent article of diet, the Celeri. This is a portion of the Apium graveolens sive palustre ; and what may be the medical or noxious qualities of this plant, it is not our business here to determine, as it is enough for our present purpose to say, that the Celeri is never employed as an alimentary matter but when it is deprived of its peculiar juices by being blanched : and in this state it is, on the footing of the other blanched plants, an alimentary matter sufficiently mild and perfectly safe. With respect to it, however, in this state, it is to be remarked, that it is never so entirely deprived of its acrimony as not to retain more taste, and a more agreeable taste, than the other blanched plants ; and upon this account it is more generally used at table. Although even in its blanched state, retaining a little acrimony, if it be very well boiled in water or broth, it becomes a tender mucilaginous, and therefore a nutritious, substance.*

After the leaves and stalks of plants, I have inserted in my catalogue an alimentary matter ; which, though it cannot be said to belong to the leaves or stalks of plants, is so much of an herbaceous nature, that it could not be so properly mentioned in any other place.

This is the *Cynara*, which I have set down under the title of the botanical order of Capitatæ, because I believe there are some others of the same order which might be mentioned ; but I mention only what I am acquainted with, the *Scolymus Cynara*, or Artichoke.

It is hardly necessary to say, that of this acrid plant the only alimentary part is the receptacle of the flower, and the portions of that which we pull away from it, in pulling away the separate squamæ of the calyx. The whole of this receptacle, even in its recent state, is of very little acrimony, and by being boiled in water is rendered perfectly mild. In its boiled state, it is of a tender texture, somewhat sweet and mucilaginous, and therefore tolerably nourishing ; but it is not remarkable for any other qualities that I can perceive ; and its interrupting sleep, if ever happening, is certainly not constantly its effect.

After the alimentary leaves and stalks, and after the artichoke, which I consider as akin to these, I have set down in my catalogue what may be considered as a part of a stalk, that is, the first

* I consider celeri, unless when very completely blanched (and it is often brought to our tables in a state very different from this,) as a vegetable of considerable activity, often exciting, in delicate constitutions, fever and headach. Boiling, doubtless, deprives it of most of its injurious, acrimonious quality.

shoots or turiones of the *Asparagus*. There are some other plants, whose turiones, though they belong to acrid plants, are said to be mild and eatable, like those of the asparagus ; but they do not appear to belong to any one order of plants, and I am not acquainted with the particulars.

The shoots of the asparagus, or at least a portion of their upper parts, when boiled in water, is very tender, somewhat sweet and mucilaginous, and therefore presumed to be considerably nourishing. When eaten in any quantity, they always soon after imbue the urine with a peculiar odour, which did not appear in the asparagus before it was taken into the body. This has given occasion to an opinion of the power of asparagus, with respect to both the urine and urinary passages ; but though frequently attending to the phenomenon mentioned, I have never found that at the same time the quantity of the urine was increased or its quality anywise changed.

Odours may arise from a very inconsiderable portion of matter, and gives no certain proof of that matter's being in large quantity present, or of its being very active, except in persons of peculiar idiosyncrasy. I am therefore disposed to be of opinion, that asparagus cannot commonly do either good or ill in the urinary passages. The instances given by Schulzius and Bergius of bloody urine, occasioned by eating of asparagus, are certainly very unusual facts, and not to be applied to any extent : and if Boerhaave and Van Swieten judged that upon some occasions they had observed the eating of asparagus to hasten on fits of the gout, I suspect some fallacy in their observation ; for I have known many instances of a negative to it.

[*The turiones of the following plants are eaten in the United-States, and they are deemed little if at all inferior to those of the asparagus; viz. Poke or American night-shade; Solomon's-seal, and different species of Milk-weed, or Asclepias.—Some of these, when in their adult state, are certainly acrid plants; but their shoots, if not advanced too far in age, and carefully boiled, are perfectly innocent, and may be deemed delicate articles for the table. None of these vegetables imbue the urine with any unpleasant odour. One of them, the solomon's-seal, belongs to the same natural family as the asparagus.*]

C. Radices, Roots.

The roots of plants commonly contain more nutritious matter than their leaves ; and the experiments of Mr Parmentier in his

Recherches sur les Vegetaux Naurissants, show that a great number of roots never before thought of as esculent, do however contain a quantity of farinaceous matter, which may upon occasion afford an aliment. I shall not, however, take any particular notice of those that require such a preparation as he proposes and describes; because I believe the farinaceous, or, as he calls it, the Amylaceous, matter extracted from those roots, is exactly the same from whatever root it has been extracted, and the same that may be extracted from other substances with much less labour. I am here, therefore, to take notice only of those roots commonly employed as food in this country in the state in which nature presents them to us, and hardly requiring any other preparation than the ordinary one of the kitchen.

SILIQUOSÆ.

The two first marked are taken from this order; in all of which, as already observed, there is found a peculiar acrimony.

The *Raphanus* or Radish, has commonly a large quantity of alimentary substance, in proportion to its cortical part, in which only the peculiar acrimony of the order is lodged. It may therefore be eaten, as it commonly is, in its recent state, with the whole of its cortical part; and for which especially it seems to be taken, as it may rather serve as a condiment to its acescent substance, and which therefore seldom proves flatulent. It does not however seem to be very nourishing.

The *Rapum* or Turnip affords a much larger quantity of mild pulp in proportion to its cortical part, in which only the peculiar acrimony of the order is lodged. As this cortical part can be entirely separated without much trouble, it is very generally the pulp only that is admitted into our diet. It is a watery and tender substance, and therefore is easily digested, and occasions little flatulency. It has some sweetness; but it does not seem to contain much nourishment in proportion to its bulk. MARGRAAF could not extract any sugar from it; and BERGIUS observes that it affords very little amylaceous matter. It is of two kinds, distinguished by their colour of white and yellow. The latter we have become acquainted with in this country only of late. It is of a more sweet and mucilaginous taste, and therefore is seemingly more nutritious than the white. As it has also another property of being more hardy in sustaining the winter, it is likely to come into the most general use.

The botanists have given us two different species of roots under the titles of the Brassica Napus or *Navew*, and the Brassica Rapa

or *Turnip:* and both the gardeners and farmers are very well acquainted with the distinction; the former being most cultivated in France, and the latter more commonly in England. With what advantages the one or other may be preferred, I cannot clearly determine; but to me they seem to differ only in the form of the root; and I can find no difference in their qualities to be taken notice of here. Both the kinds are much employed in feeding cattle; and as they are given to them with the cortical part, it is alleged that they are ready to communicate an odour and taste of a disagreeable kind both to the flesh and milk of cows; but this does not seem to be constantly the case: And I think it is worth observing, though foreign to this place, that the milk of cows is not always affected by turnip; and perhaps only when some portion of the decayed leaves of the plant are given along with the root.

UMBELLATÆ.

Daucus. This is a root of very frequent use; and though it does not readily yield a grained sugar, yet it yields a great deal of sweet or melliginous juice, which gives a strong mark of its nutritious quality. In this root there seems to be a quantity of mucilaginous matter which prevents it from yielding a grained sugar, but at the same time undoubtedly contributes to its being nutritious. Experiments on brute animals show the Carrot to be nourishing in a considerable degree; and it is certainly so to man, affording a tender and not very flatulent food. The effects of these roots in poultice, and of the seeds of the plant as a medicine, will be considered in another place.

Pastinaca or Parsnip. Experiments on brutes show these roots to be considerably nourishing. They have a considerable sweetness in their taste; and they manifestly contain a great deal of mucilage; which though it prevents their yielding much of a grained sugar, by no means detracts from their nutritious quality. A peculiar taste which remains in them even after boiling, is disagreeable to a great many persons. Whether this peculiar taste in the skirret and parsnip is accompanied with any diuretic quality, we will not positively determine; but we have not upon any occasion perceived it.

Sisarum. The roots of this plant in their recent state seem to be of a firm consistence; but by boiling in water they are brought to be very tender. Mr MARGRAAF found them to yield a large proportion of sugar, and Mr BERGIUS found them to afford a quantity of amylaceous matter; and on account of both they are considerably nourishing and not very flatulent: but on account of a pe-

culiar taste approaching to that of the parsnip, which remains in them even after boiling, they are not in such general use as might be expected.

With respect to these roots, the observation of Mr Bergius, that their saccharine part does not go along with the amylaceous when this is separated, may deserve notice, as it may lead to some inquiries and speculations relative to the nutritious parts of vegetables.

Semiflosculosæ.

Of this order there are two alimentary roots, the *Scorzonera* and the *Tragopogon*, by the gardeners commonly called *Salsafi*.* These roots resemble one another both in their alimentary and medicinal qualities as much as they do in their botanical characters. They are lactescent roots, but with a singular mildness in their juice which has a little sweetness; but neither by that nor by any other sensible quality do they give marks of their being very nourishing. When boiled, they are sufficiently tender, and do not prove very flatulent. Their medical virtues, if they have any, shall be taken notice of in another place. In the mean time, I must observe my being a little surprised at the otherwise judicious Bergius recommending the treatise of Fehr de Scorzonera, which appears to me to be a very frivolous work, and of no authority.

Alliaceæ.

Of this tribe we have a set of roots of much more activity than these last mentioned, and by that being of more importance as medicinal than as nutrimental.

Of these roots, the *Garlic*, *Roccambole*, and *Shallot*, we suppose to be employed as condiments rather than as aliments. They indeed truly contain alimentary matter; and when the Garlic in certain climates is produced with less acrimony than it is with us, it may perhaps properly enough make a part of diet.

Of this order they are the *Porrum* and *Cepa* that are most commonly employed as alimentary matters, and afford indeed a large proportion of it. This appears especially in their boiled state, in which their acrimony is exhaled, and they show with some sweetness a large proportion of mucilaginous matter. Even in their recent state, and especially when young, their acrimony is not so strong as to prevent our vulgar from taking them as a considerable part of their food. By our better sort of people, it is the onion only that is taken in its young and recent state, but hardly in larger quantity than may be considered as a condiment. Deprived, how-

* In the United-States, Oyster-plant.

ever, of their acrimony by boiling or roasting, they are used by all ranks more largely. It is, however, so difficult to deprive them entirely of all peculiar taste, that I have known many persons who, from a particular idiosyncrasy, cannot bear them even in a boiled state.

The acrimony of the Alliaceæ is very nearly of the same nature with that of the Tetradynamia, and have therefore the same diuretic quality: but this, with respect to both orders, is to be considered in another place.

To the list of roots I have here added the *Batatas* or Potatoes, or the roots of the *Solanum Tuberosum*, now become in almost every country of Europe, and especially in our own, an important article of diet. I shall, however, consider this root as entirely a farinaceous matter; and as it may be proper in the first place to consider these farinaceous matters in general, I shall afterwards take up the consideration of particulars, and among the rest that of the Potatoes and others.

D. SEMINA, *or the* SEEDS OF PLANTS.

THESE are in general and chiefly nutritious, as containing a farina or farinaceous matter; and as such they make the most considerable part of the aliment of men over almost the whole of the earth. This has led Dr HALLER to introduce the term of *Farina Alibilis*, and to mark it as the chief part of our vegetable aliment. To avoid, however, the inaccurate idea that might arise from this, we have taken some pains above to show that farina, or that powdery substance which is found in nutritious seeds, is a compound matter, consisting chiefly of sugar and oil. These, indeed, are often so blended together into what may be called a neutral substance, that the properties distinguishing the two ingredients can hardly, or at least rarely, be perceived in the compound. Although it is not in our power to explain in what manner the vegetable œconomy forms the various compounds it produces, nor to account for the appearances these productions put on, yet we judge it to be shown above, that the compound we name Farina is truly such as we here suppose it; and that by marking the appearances or experiments which show more or less of the saccharine or oily matter in the several seeds, we may in some measure ascertain their several qualities. Upon this plan we now proceed to treat of particulars.

We refer the several farinacea to three different heads, under the titles of *Cerealia*, *Legumina*, and *Nuces Oleosæ;* which though not quite exact, is sufficiently so with regard to the most part of

them. By this assortment, we think they may be distinguished as they contain more or less of saccharine and oily matter, or as these are in proportion to one another. In the Cerealia, we suppose the sugar to be large in proportion to the oil; in the Legumina, the oil to be somewhat larger in proportion to the sugar; and in the Nuces Oleosæ, the proportion of the oil to be still greater. At the same time we believe it will be found, that in the several farinaceous seeds the nourishment they afford is in proportion to the oil they contain.

a. *Cerealia.* Under this title are commonly put the seeds of the several gramineous or culmiferous plants that are employed as the food of men. It is, we believe, justly supposed, that the seeds of the whole of this order contain a farinaceous matter of a similar nature, and that our choosing those to be here enumerated is merely from the size of their product, which allows them to be more easily collected in considerable quantity, or perhaps from their being more easily cultivated in certain soils and climates. This in the main may be just; but there is some difference in the qualities of the Cerealia here enumerated, which we must now take notice of.

Hordeum, Barley.

In the species of this there is some difference, according to the number of seeds in each row of the ears; and hence the Hordeum Distichum, Tetrastichum, and Hexastichum: and this difference is attended with some difference in the size and plumpness of the grain, but with no difference of qualities that we can perceive.

We have observed above, that all the Cerealia by their germination have their saccharine matter evolved, and therefore more readily subjected to a vinous fermentation. This seems to take place more readily, perhaps more fully, in barley than in any other of the Cerealia; and therefore it is the grain from whence very universally our Beers and Ales are prepared. Whether barley actually contains a greater proportion of saccharine matter than the other Cerealia, or merely differs from them by that matter's being more readily evolved, we dare not determine; but from the circumstance of its ready evolution, it appears probable, that the barley contains in its farina a smaller proportion of oil than some other grains, and upon that account is less nourishing than those others. This is confirmed by the experience of our vulgar, who sometimes live on barley and sometimes upon oats. In some higher parts of this country where they raise much barley, and therefore live more upon it, it is common for them to purchase a

quantity of pease to mix with their barley, in order to render their bread and other food more nourishing. The same is confirmed by experiments on brutes, who are not found to be nourished equally by the same quantity of barley as of oats.

Barley is employed as a part of diet both in its unmalted and in its malted state. In the former, however, almost only, it is employed as a common aliment; and I do not know that there is any experiment or observation which shows that barley in its unmalted state is a more antiseptic aliment than any other grain. Of late, however, we have learned, that in its malted state, its saccharine matter extracted by infusion in water, and given as a part of diet, proves remarkably antiseptic. I have no doubt that this is to be imputed to its acescent quality as a saccharine matter. It is long ago since I pointed out sugar as an alimentary matter, and as being fitted for obviating the putrefactive tendency of the animal fluids; and it was from this hint that Dr Macbride, as he himself informed me, first proposed the employment of wort for preventing the scurvy. I am still persuaded that a plain sugar may be employed for this purpose; but I shall hereafter observe, that sugar cannot be employed alone in large quantity with the same safety as when it is accompanied with some farinaceous or oily matter, which renders it more ready and proper to enter into the composition of the animal fluid.

A decoction of barley, or as it is called barley-water, is a drink employed in many diseases; and it is not unworthy the attention of the physician to direct the proper preparation of it. Accordingly the London and Edinburgh colleges have both given their directions for this purpose. The particular scope of their directions is, that as the decorticated, or as it is called pearl barley, is by long keeping liable to get a mealiness upon its surface, which is ready to become musty, the barley should be, by repeated ablutions, well freed from the mealy part on its surface before it is subjected to decoction.

Secale, Rye.

How this grain turns out in malting, I have not had an opportunity of learning, as the culture and employment of it is rare in this country; but as in the northern countries of the continent it is frequently employed for affording an ardent spirit, there can be no doubt of its containing a due portion of sugar. By the large quantity of mucilage, three-fourths of its weight, that it affords by decoction in water, it may be presumed to be sufficiently nourishing. But its not affording any milkiness to water triturated with

it, shows that its oil is under a peculiar combination; and if there be a due portion of oil in it, it is difficult to explain why this grain, of all the other Cerealia, should be the most readily acescent. This indeed might seem to detract from its nourishing quality; but the experience of the northern countries of the continent sufficiently establish it. It is little employed as an aliment with us; and the people unaccustomed to it, upon occasionally taking it, generally find it laxative; which is readily explained by its acescency.

With respect to the nature and effects of the Secale Cornutum, I must leave it to be determined by the study of many late writers upon the subject. Rye is so little cultivated in this country that I have had no proper opportunity of examining the matter myself, and can only say, that though there are several people of this country who take rye pretty constanly as a part of their diet, I have never known or heard of any peculiar disease arising among them.

MILIUM, MILLET.

This is so little used in this country, that I have had little opportunity of judging of its qualities. It has some sweetness, but does not discover much acescency, and seems to be easily digested. That this or any other of the Cerealia binds the belly, I will not believe upon the authority of HIPPOCRATES himself.

ORYZA, RICE.

This is a grain which has long been the farinaceous aliment of the greatest part of Asia, and has now for a long time been employed as an aliment in Europe; but its peculiar qualities are not easily ascertained. It has little sweetness, is not readily acescent, nor readily subjected to fermentation. From these circumstances, and as at the same time it is by the testimony of all Asia sufficiently nourishing, we would judge that its oil, though very intimately united with its saccharine part, is, however, in good proportion; and I would judge it to be more nourishing than any of the grains already mentioned. Upon what grounds SPIELMANN supposes it to be less nourishing than barley or rye I cannot preceive. Its nutritious matter is not attended with any noxious quality that I can discern; and therefore the notion that has sometimes prevailed in this country of its being hurtful to the eyes, seems to be without foundation. It has been supposed among physicians to be possessed of some drying or astringent quality, and has therefore been commonly employed in diarrhœa and dysentery preferably to the other farinacea; but this opinion also I

take to be groundless: for it does not give any mark of astringent quality with the vitriol of iron; and if it has ever been found useful in diarrhœa, it must, as SPIELMANN properly judges, be owing entirely to its demulcent power; which, however, is not stronger in it than in several others of the farinacea.

[*ZIZANIA, WILD-RICE, WILD-OATS. Different species of this genus of gramineous plants are extremely common in many parts of North-America, growing in marshes, rivers, and other wet situations. Their seed contains an excellent farinaceous matter, which is eaten by, and greatly constitutes to fatten, many species of birds, &c., and even contributes no inconsiderable portion of the vegetable food of many Indian nations, especially those who reside too far north for the easy growth of the mays, or Indian corn. It is not quite certain, that the zizaniæ were not *cultivated* by some of the tribes: it is certain, that they were studiously careful of the preservation of these plants, whose precise chemical composition is still a desideratum in the history of aliments. See *Fragments of the Natural History of Pennsylvania.* Part First.*]†

AVENA, OATS.

This is a farinaceous food used by many people in the northern parts of Europe: but it is especially the food of the people of Scotland, and was formerly that of the northern parts of England; countries which have always produced as healthy and as vigorous a race of men as any other in Europe.

The meal of this grain discovers little sweetness, and rather when a little toasted gives what we call a kernal taste, approaching to that of the nuces oleosæ. In its sound state, it is entirely without any bitterness; which SPIELMANN and some writers have alleged to be in the bread made of it. It discovers no more acescency than the other farinacea; and when malted is readily subjected to fermentation, and affords an ale which, though seldom made very strong, is very agreeable and without any bitterness. The nourishing quality of oats, both with respect to men and brutes, is in this country very well known; and I use the same reasoning with respect to its saccharine and oily parts, as I did above with respect to Rice. With respect to it, physicians and the vulgar have fallen into contrary opinions; but both of them, as I judge, mistaken. The former, especially the French, speak of it as refrigerant; but it is merely so as being a vegetable aliment not heat-

† See, also, the Editor's Inquiries into the original,..................physical history, &c. &c., of the North-American Indians.

ing. The vulgar, and especially the great vulgar of England, from its being ready to give some heartburn, or sense of heat at stomach, have supposed it to be heating; and from a mistake with regard to the state of diseases, have supposed it to give cutaneous affections, not more frequent in Scotland than in other countries; and which indeed arise from no particular aliment, but always from a contagion communicated from one person to another. With respect to the heat perceived at the stomach, it is owing to the acescency which oat bread, commonly unfermented, is liable to occasion; and I have frequently found, that unfermented bread of wheat meal was equally liable to give the same heartburn and sense of heat at stomach. Where a decoction of oat-meal, or water-gruel, is in request, I think it proper to mention here in what manner it may be rendered most agreeable. An ounce of oat-meal is sufficient to make two quarts of water-gruel. This meal is to be put into three quarts of soft cold water, and set over the fire. The meal is to be constantly stirred among the water till it boils; and then it is to be allowed to boil till a third of the water is boiled away. The decoction is then to be poured through a linen cloth into a bowl a little larger than sufficient to contain it. In this bowl it is to be left to cool; and when cooled it will be found to separate into two parts, one of them a mealy cloud or sediment, and the other a very thin and clear liquor. The latter is to be carefully decanted or poured off for use. To render this more agreeable, by the addition of sugar, acids, or aromatics, or to impregnate it with medicinal substances, I leave to the judgment of the nurse or of the physician.

Zea, Maiz.

This is entirely an American grain, affording a farina of the best quality, and largely nourishing both to men and brutes, as the experience of America has fully ascertained. The ripe seeds are of a hard substance, but may be broke down into a very fine meal. This has little sweetness, and no acidity that I can perceive. By itself, and even with yest, it does not ferment so well as to give a light bread; but added in pretty large proportion to wheat-meal, it may be made into a very perfect bread.

[*Dr Cullen seems to have been but very imperfectly acquainted with this most important of all the cerealia, which continues to be cultivated through an immense tract of the two Americas. There are many varieties of the Indian corn; and, perhaps, future and more careful researches may discover, that even in North-America, more than one *species* of the genus is cultivated. The meal of all the varieties that I have seen, has an evident sweetness: but this

sweetness is peculiarly observable in the white corn, which, it is known to every distiller, furnishes more spirit than the yellow, or other coloured corn. If the grain of maize be not ground too *close* (that is too fine), it readily ferments, and forms a light and most easily digestible food. And I believe it is a fact, that the fermentability of this grain is greater in the warmer than in the colder climates of North-America.

This is, unquestionably, the most nutritious of all the cerealia, hitherto discovered: and as no one other of this family of plants can be cultivated through so great a geographical range, so it is the most valuable of them all. Among many other facts that might be mentioned, experience has fully shown, that negroes, on the plantations, cannot be so well supported upon a given quantity of wheaten as of Indian bread. It is to be observed, however, that the stomach does not always easily pass from the use of one of these breads to that of the other. I have remarked too, that in cases of weak or imperfect digestion, and especially in the hotter weather, the Indian bread (to those not accustomed to it) is sometimes more apt to become acescent than the wheaten.

Marabelli and some others have given us the chemical analysis of maize. It is found to contain "a saccharine matter of different degrees of purity, from which alcohol, the oxalic and acetous acids, may be obtained; a vegetable amylaceous substance, a glutinous substance; muriat and nitrat of magnesia; carbonats of potash, lime, and magnesia; and iron."*]

Triticum, Wheat.

This is the farinaceous food most generally used by the better sort of people over the whole of Europe, excepting the very northern parts in which it cannot be produced; but even there it is imported for the use of persons of condition. It has this advantage, that it can be formed into a more perfect kind of bread than any other of the Cerealia that we yet know of; and before going further, it seems proper to take this opportunity of saying something of bread in general.

When food is taken into the mouth, it is often necessarily detained there, in order to be subjected to a proper manducation; and even when it is of so soft a kind as not to require that, it certainly conduces to digestion that such food be detained in the mouth till it is divided into small parts, and at the same time intimately mixed with the saliva. For this purpose of detaining food till it is subjected to a due manducation, it will be evident that no measure can be more proper than the taking in along with our

different foods a quantity of dry, friable, and nearly insipid matter. Such a matter is bread, in itself also nutritive: and we might say more with respect to the propriety of its use; but it is enough to remark in proof of its being particularly suited to the purposes of the human œconomy, that, very universally, mankind are impressed with an instinct to employ it. While the farinacea are distributed so universally over the face of the earth, and have become the chief objects of culture, they are very generally made into bread; and as generally a portion of them is taken into the mouth alongst with almost every morsel of other foods. That this is a general instinct, and suited to the purpose of the human œconomy, is well illustrated by this, that the Laplanders, in want of the vegetable farinacea, make a powder of fish-bones, and employ it made into a bread. This is the general idea of the purpose of bread, which is very universally made of vegetable farina. But as it would be inconvenient to employ this in its powdery state, so it is brought into a coherent mass by water, and this again is brought into a dry and friable state by a proper application of heat, or what we call baking; and by all this rendered fitter to be divided and taken in separate morsels.

Bread may be prepared of any of the farinaceous substances already mentioned; but in many cases the bread so prepared is less dry and friable, less miscible therefore with the saliva and with our other foods, and perhaps less wholesome than might be desired. Mankind, therefore, have studied and found out a means of correcting these faults and imperfections of the bread made of meal and water alone; and this they have found to be, by subjecting the paste of meal and water to a certain degree of acescent fermentation before it is again dried or baked into a bread. Under this fermentation it is found, that the mealy paste has a large quantity of air extricated, probably exhaled; but as a quantity of it remains still diffused, the mass is swelled into a larger bulk, and when the heat is applied, the bread formed is of a more spongy texture, more tender, friable, and more readily miscible with the saliva and with our other foods.

These qualities give the most perfect bread; but the most complete fermentation cannot be given with equal success to every kind of farina. Most of the kinds hitherto mentioned made into a moist paste, and kept in a warm place, will enter into some acescent fermentation, and this fermented portion added to another quantity of the same paste, will communicate some fermentation to the whole, which when baken, will give a bread of a lighter kind than could

have been formed of unfermented paste. In some other cases also, where the fermentation of the paste alone does not succeed so well as might be desired, it may be assisted by an addition of yest, or lees of ale; but even this does not give with any of the farinacea, excepting wheat, a very perfect bread. It is therefore with wheat-meal only, without any foreign ferment, and by its spontaneous fermentation alone, that the most perfect bread can be obtained. That this is the peculiar property of wheat appears from hence, that even these farinacea which by themselves cannot by any art be brought to afford a perfect bread, yet, by being joined with a certain proportion of wheat, may along with this be brought into the state of perfect bread.

This peculiar property of wheat was observed very long ago; but the cause of it was not perceived, whilst wheat seemed almost in every respect to possess only the qualities in common to most of the other farinacea. It was about the year 1728 that Beccaria of Bologna discovered something in the constitution of wheat very different from what he could discover in any other of the farinacea. This is a glutinous matter which remains after the amylaceous part is washed off, and which has the properties of animal substances, very different from the properties of the other part of the wheat, and from those of any other vegetable farina yet known. This discovery has been since confirmed in every respect by many other philosophers and chemists of Europe; and it is now published in so many writings, and so commonly known, that it does not seem necessary to enter into any further detail concerning it here. We have introduced the mention of it chiefly to say, that it is probably this part in the constitution of wheat that renders it fitter for a spontaneous fermentation, and by perhaps a peculiar mode of fermentation, to form wheat into a more perfect bread than can be made of any other farinaceous substance taken entirely by itself. That this is the effect of the glutinous part of wheat, appears very probable from hence, that by the addition of a portion of this glutinous part of wheat to other farinacea, they can be brought into a more perfect bread than they could by any means be brought to without such addition.

We have thus explained the peculiar property of wheat in being fit to give a more perfect bread than any other farinaceous substance; but wherein it otherwise differs from these, we dare not determine. Since the discovery of Beccaria, most physiologists, except Mr Parmentier, have been of opinion, that, on account of its containing a matter approaching to the nature of ani-

mal substance, it should afford to animals a greater quantity of nourishment than an equal weight of these which do not contain any such matter. This, however, is not quite certain: for though by the operations of BECCARIA, a glutinous matter cannot be separated from the other farinacea in the same manner as from wheat, in which, even in the grain, it seems to lie separate from the other substance of it; yet it may, notwithstanding, be present in the other farinacea in a more diffused, and therefore more inseparable state. The coagulable nature of the other farinacea by heat, as a property belonging to animal substances, gives some presumption of their containing something of this kind; and it does not appear certain that wheat gives more nourishment to men, or other animals, than some others of the farinacea do. In short, till experiments shall have determined this, we are disposed to conclude, that the property of wheat, which has rendered it so generally employed and preferred, is merely its superior fitness for affording a more perfect bread.

While we are upon this subject of bread, it seems very proper to enter upon the discussion of an opinion which in modern times has very much affected our reasonings concerning the qualities of the farinacea employed in diet. The discovery of the circulation of the blood naturally led physicians to consider obstruction as a principal cause of disease; and while they were ignorant of, or inattentive to, the other possible causes of obstruction, they were ready to suppose a certain state of the fluids to be the chief cause of it. This gave occasion to the Cartesians to introduce the doctrine of a lentor; and which, from the application of it we have now mentioned, has prevailed in our pathology ever since. We are not here to consider whether it be well or ill founded; and are only to take notice of a mistake which it has occasioned with respect to the use of farinaceous matters in diet. Dr BOERHAAVE having given the *glutinosum pingue* as one of the simple diseases of the fluids, has assigned as the first cause of this, the use of the *farinosa non fermentata*: and his learned commentator has taken up the opinion, and repeated it, though not always with consistency, in many parts of his work. In entering upon the consideration of this, we are willing to own that a farinaceous substance formed by fermentation into a perfect bread, is the most wholesome condition in which farinaceous matters can be employed as a part of our food; and we are also ready to allow that the unfermented farinacea taken in immoderate quantity, especially at a certain period of life, or in dyspeptic stomachs, may be the cause of disease: but

all this seems to have been exaggerated; for the morbid effects of unfermented farinacea are truly rare occurrences; and indeed the same unfermented farinacea are for the most part very well suited to the human œconomy.

However considerable the use of fermented bread may be, the use of unfermented farinacea is still very great and considerable amongst almost every people of the earth. The whole people of Asia live upon unfermented Rice; and I believe the Americans, before they became acquainted with the Europeans, employed, and for the most part still employ, their Maize in the same condition. Even in Europe, the employment of unfermented bread, and of unfermented farinacea in other shapes, is still very considerable; and we are ready to maintain, that the morbid consequences of such diet are very seldom to be observed. In Scotland, nine-tenths of the lower class of people, and that is the greater part of the whole, live upon unfermented bread, and unfermented farinacea in other forms; and at the same time I am of opinion, that there are not a more healthy people any where to be found. In the course of fifty years that I have practised physic amongst them, I have had occasion to know this; and have hardly met with a disease of any consequence that I could impute to the use of unfermented farinacea.

Physicians who represent these as a noxious matter, must at the same time acknowledge, that in every country of Europe it is often used with perfect impunity. To obviate, however, the conclusion I would draw from this fact, they allege, that it is only safe when used by robust and labouring people; but we give it in this country, not only to the farmer's labouring servants, but to our sedentary tradesmen, to our women, and to our children; and all of the latter live and grow up in good health, except a very few dyspeptics who are not free from complaints, which those also are liable to who live on fermented wheaten bread. What may happen to children who from their birth are fed with pap instead of a mother's milk, I cannot determine, because I have not had occasion to observe such a practice. In this country, our children have hardly any other food except their mother's milk for the first five months of their life; but after that period, or perhaps sooner, oatmeal pottage, with cow's milk, is gradually introduced as a part of their diet. After their being weaned they are put upon this very entirely; and the bad consequences of it at either period we have never perceived.

From all these considerations, it will appear that a great deal too much has been said of the noxious effects of unfermented fari-

nacea. I have said above, that it would surprise modern physicians to find that CELSUS (who like other ancients can hardly be in the wrong) should say, that unfermented was more wholesome than fermented bread. I am ready to allow that he was in the wrong: but I am disposed to suspect that it happened from his observing that the lower people, who lived on the unfermented, were generally more healthy than those of the better sort, who lived upon fermented bread.

We have thus offered some reflections on the several Cerealia, strictly so called, that are used in this country; and must now say a little of several farinaceous substances which are not of the tribe of Gramina, but very much of the same farinaceous nature with these.

FAGOPYRUM, BUCKWHEAT.

This is so little used as an aliment in this country, that I have hardly had any opportunity of studying its effects; but from all appearances, it has the common quality of a farina. The common employment of it by the weaver shows its mucilaginous nature; and in feeding poultry it appears to be considerably nourishing.

SAGO, or SAGU.

This in our Catalogue we have referred to the Cycas circinalis; but whether properly or not seems uncertain: and it is not necessary for us to determine the matter more exactly here, as we believe it is obtained from different trees, which though somewhat different, afford one and the same kind of substance, such as we have it imported under the name of Sago.

It comes to us in a granulated form of a farinaceous matter, which by being boiled in water is resolved into an insipid almost transparent jelly. Its gelatinous state points it out as a nutrient matter: and we are assured that it is much employed as such in the East Indies, and that in some parts of that country it makes a great part of the food of the inhabitants. The value which the Japanese put upon it appears strongly from the account given of it by THUNBERG in his Flora Japonica, under the article of Cycas revoluta.—"Drupæ comeduntur a Japonensibus; medulla autem caudicis, supra modum nutriens, imprimis magni æstimatur; asseverant enim, quod tempore belli frustulo parvo vitam diu protrahere possunt milites; ideoque ne commodo eodem fruatur hostis extraneus, sub capitis pœna vetitum est, palmam e regno Japonico educere."

We have no experiment to determine the proportion of nourishment which it affords in Europe; but must think it considerable:

and as a matter readily soluble, it is properly in this country given as an aliment to weakly persons.

SALEP, OR THE ROOT OF THE ORCHIS MORIO.

The preparation of this root, by which it is brought into the state of a farinaceous powder, is now well known. As brought to us from Turkey, it is supposed to be formed from that species of the Orchis above set down; but from Mr MOULT's account in the philosophical Transactions, vol. lix. it may be formed from several other species of the same genus; and I have seen it prepared in this country from the Orchis bifolia, as pure and perfect as any that comes from Turkey. In either case it is an insipid substance, of which a small quantity by a proper management converts a large portion of water into a jelly. This gelatinous quality presumes it to be nutrient; but we know of no experiments that have ascertained the degree of its nutritious quality, and we judge it to have been greatly over-rated.

The demulcent qualities both of this and of the preceding article will be considered hereafter.

It is now proper for me to consider another farinaceous root, as I promised to do after considering the other farinacea. This is the POTATO, or Roots of the *Solanum Tuberosum*. This root, by a proper drying, is readily brought into a farinaceous powder that has every property of the Cerealia, except that it affords no gluten or animal matter, as wheat does. It affords a large proportion of an amylum, precisely of the same nature with that of wheat, or of any other of the Cerealia. Its nutritious quality in general is now ascertained by the experience of all Europe, as in almost every part of this it makes a considerable portion of the food of the vulgar. As, however, the Potato contains such a considerable proportion of water, amounting to one half or more of their whole weight, they cannot be supposed to give, in proportion to their bulk, so much nourishment as the Cerealia do. In compensation, however, of this, their watery texture renders them of easy solution and digestion in the stomach; and I think they are less liable to become acescent, or to give heartburn, than the unfermented Cerealia.

Whilst the Potatoes are nourishing, as we have said, they are without any noxious quality that I can perceive; and I am much surprised to find it has cost Mr PARMENTIER so much trouble to engage many of the philosophers of his country to approve of the use of this root, while the vulgar, by the sure guide of experience, are universally reconciled to it. To confirm this, I do not think

it neeessary to employ any other chemistry than what is mentioned above.†

As the people of this country do not put so much value on fermented bread as those of some other countries do, so we have hardly thought of making Potatoes into a fermented bread; but with the vulgar they frequently answer the general purpose of bread taken in their boiled state, in which they are often found to be dry and mealy.

The other modes of cookery proper for introducing this root into diet, are now sufficiently known; and whoever would inquire more curiously into this may consult PARMENTIER and BERGIUS.

[* Another farinaceous root, considerably allied to the common potatoe, is highly worthy of notice in this work. This is the CONVOLVULUS BATATAS of the botanists, but known by the English names of Sweet-Potatoe, and Long-Potatoe. This, as well as the former, is an American plant, and has, for a long time, been cultivated by the Indian tribes in various parts of North as well as South-America. There are several varieties of the plant, which is cultivated in the United-States, as far north as latitude 40. But the root arrives át greater perfection, both in size and quality, in the southern states of the Carolinas and Georgia.

This is certainly a very important vegetable, which ought to be introduced into all the countries of the world where it is yet unknown, and in which it may be propagated. It will be in vain to attempt its propagation in the cold climates of Europe and Asia, where the solanum tuberosum not only will grow, but even attains to a considerable degree of perfection. But the sweet-potatoe may be cultivated in many parts of the world, where at present it is but little known as an article of diet, as in France, Spain, Portugal, Germany, &c.

A good sago has been prepared from this root, and is deserving of some notice.*]

[* After the sweet-potatoe, I introduce the two articles, now so much employed in the practice of the United-States, called ARROW-ROOT, and TAPIOCCA. These are truly important nutritious substances, which are especially adapted, as such, to the management of the ailments of children and of the female sex.*]

† There are not a few persons with whose stomachs the potatoe does not agree. It is, however, especially the young or new potatoe which produces sickness at stomach, eructation, &c.

[* Tuber Tucca, Tuckahoe. I am induced to mention this article in this place, from a desire to call the attention of physicians and naturalists to it, and not from the hope of being able to say any thing very important concerning it. The tuber tucca, as I denominate it, is a solid subterraneous vegetable production, belonging to the Linnæan class and order of cryptogamia fungi, which often acquires the size of a man's head, and weighs several pounds. It is chiefly composed of a whitish farinaceous matter, which has an agreeable, somewhat sweetish taste, and is unquestionably a very nutritious substance. It was formerly much employed by the Indians in many parts of North-America, as an important article of diet. The name tuckahoe, by which it is known in the United-States, signifies "bread-plant." Powdered and mixed with the meal of rice, it forms a delicate cake, which is sometimes met with at the tables of the southern planters.

It is much to be wished that the chemical analysis of this substance, and its real affinity to the *farina alibilis* of the cerealia and other vegetables, were pointed out by some able hand. See *a Discourse on some of the principal desiderata in natural history*, &c. page 46.*]

Castanea, the Chesnut.

As these fruit afford no oil by expression, I could not, as I had formerly done, insert this article among the Nuces Oleosæ, and have been a little uncertain where to place it; but I can find no place more proper for it than here, after the Cerealia and other farinaceous matters which resemble these.

The Chesnut has a good deal of sweetness, which is more evolved by heat applied; and its saccharine nature is sufficiently evident from the fermentable nature of its juice. Though it gives no oil by expression, yet from the oil that is manifest in the fruit of the Fagus Sylvatica, it may be supposed to be in this also, although it happens to be more intimately united with the saccharine part. Both together form a farinaceous matter which can be made into bread, and treated in every manner that the other farinacea can be. Its nutritious qualities are well known to the people in the southern parts of Europe, amongst many of whom it is often the chief and almost the whole of their food. It is said to be of difficult solution and digestion; and from the firmness of its texture, this might be suspected: but, as said above, this quality is more frequently suspected to be hurtful than it ought to be.

b. *Legumina, Legumes or Pulse.*

These terms have not been accurately applied; but we would strictly confine them to the fruits of the papilionaceous plants; to the capsule of which, of a determined structure, the botanists have now affixed the term of Legumen.†

In entering upon the subject, we cannot help beginning with an observation, which though seemingly not connected with our treatise of materia medica, is not altogether foreign to it. It is this, that the seeds of the legumina are a farinaceous substance, affording an alimentary matter, upon the same principles as the cerealia and farinacea in general do: and these two substances, the cerealia and legumina, make the greatest part of the vegetable aliment employed by men. They are therefore very universally the objects of the farmer's culture: and it is agreeable to observe how well these two orders of plants, the Culmiferæ and Papilionaceæ are particularly adapted to that purpose. Whilst the culmiferæ raised upon the same soil for several years successively exhaust and render it barren, so that without rest or manure, its fertility cannot be maintained; but if, instead of repeating upon the same soil the crops of the culmiferæ, these crops are alternated with crops of the papilionaceæ, the fertility of the soil may be preserved without rest or manure for many years together. This I know from experience; and it shows how well these two objects of the farmer's culture are adapted to his purpose; and that, while farinaceous matters in general are the alimentary substances required, nature has given them of two different kinds, to favour the cultivation of both. This observation, though of the utmost importance, is not always properly observed by the farmer; but it was very anciently perceived, and in general observed.

Hence Virgil:

[*Alternis idem tonsas cessare novales,
Et segnem patiere situ durescere campum.*]
Aut ibi flava seres, mutato semine, farra;
Unde prius lætum siliqua quassante legumen.
Aut tenues fœtus viciæ, tristisque lupini
Sustuleris fragiles calamos, sylvamque sonantem.

[*Alternate fallows rest th' exhausted earth,
And gradual fit the soil for future birth;

† See the Editor's Elements of Botany, vol. 1. p. 186—190. and vol. 2. Class XVII. Diadelphia.

Or sow with golden corn the furrow'd clod,
Where the bean harvest burst the shatter'd pod,
Or the light vetch and bitter lupine grew,
Bow'd to the gale, and rattled as it blew.

SOTHEBY.*]

The other ancient writers on husbandry always mention the leguminous crops as answering the purpose of manure; and the moderns have properly named them Meliorating Crops. The reason of all this might be given, but it is not proper in this place.

[*In the United-States, the leguminous plant which is most generally, and indeed almost only, sown with the view of meliorating the soil, is the trifolium pretense, or common red clover. Some species of cassia are also sown, especially in Virginia; but I suspect that the theory of the operation of this cassia is not well understood.*]

The seeds of the Legumina, when quite ripe and dry, are readily broke down into a fine powder, in its consistence resembling the farina of the cerealia, but of a more unctuous softness, and of a sweeter taste. When triturated with water, they give a more milky solution than the cerealia; and when the entire seeds are treated by expression, with a considerable heat applied, they give manifestly an oily exsudation. In their germination they show a considerable quantity of a saccharine matter evolved; and in this state their solution is readily enough subjected to a vinous fermentation. Their resembling the cerealia is further evinced by their affording, in consequence of a proper treatment, a considerable quantity of amylum. All these considerations show that the Legumina contain a saccharine matter equal to that of the cerealia, and at the same time a greater proportion of oil; which explains sufficiently why the former are more nourishing than the latter. This is confirmed by daily experience in brutes; and its being the same in men I am assured from this observation: On certain farms of this country, upon which the Legumina are produced in great abundance, the labouring servants are much fed upon that kind of grain; but if such servants are removed to a farm upon which the Legumina are not in such plenty, and therefore they are fed with the cerealia, they soon find a decay of strength; and it is common for servants, in making such removals, to insist on their being provided daily or weekly with a certain quantity of the leguminous meal.

It is perhaps owing to the leguminous seeds being of a more oily quality, that they are not of so easy solution as the cerealia, and are therefore suited to the more robust people. They have also another quality which very much affects the digestion of them. By the experiments of BOYLE and HALES, it appears that they contain a large quantity of air in a fixed state, which during their digestion in the stomach is extricated in greater quantity than can be again absorbed: and upon that account these legumina have been at all times noted for occasioning flatulency, and sometimes colic pains.

It is to be remarked, that the legumina are used in two different states: one is, when they are young, and therefore of a tender texture, easily digested, and giving less flatulency, but at the same time giving less nourishment: the other state is, when they are ripe; in which state they are more nourishing, but with the qualities of being difficultly digested, and of occasioning flatulency, as we have said. Their qualities in the various intermediate states may be judged of as they approach more or less to the one or other extreme.

After saying thus much of the Legumina in general, I need say little about the particulars.

PISUM, PEASE.

FABA, the BEAN.

The difference of these, with respect to the general qualities mentioned above, is very inconsiderable. The pease, though perhaps less nutrient and less flatulent than the bean, are generally more tender; and therefore it is that the pease, in their full grown state, are more frequently, and almost only, upon our tables. With respect to their young state, the same difference may appear; but I believe it is for the following reason, that the pease can be more conveniently employed in a younger state than the bean. The husk of young pease is a tender and soluble substance, and is never separated from the fleshy part of the pea; whereas the husk of the bean is not such a soluble matter, and is therefore commonly and very properly separated from the body of the bean, especially when this is in any thing of an advanced state.

With respect to both these Legumina in their young state, there is a considerable variety of them both for the purpose of the gardener and of the table; but the difference of their qualities for the latter purpose is not considerable, and may be easily ascertained by the circumstances to be perceived in the taste of them, as they are sweeter or more mucilaginous.

PHASEOLI, KIDNEY BEAN.

These in their ripe state cannot be easily produced in this climate, and therefore seldom appear upon our tables. They are said, and seem to me, to be less nutrient and less flatulent than the pease and beans. The Phaseolus in this country is only employed in the young and green state of their Legumina; and some species of pease may be employed in the same manner. In both cases, the substance when well boiled is of the oleraceous kind: but though sweeter and more nutrient than these, is still tender and easily digested.

[*Arachis, Ground-Nut, or Earth-Bean. This is strictly a leguminous plant, the kernels of which contain a very large quantity of a fine, mild oil, blended with a sweetish farinaceous matter. The whole kernel is much eaten in the United-States, especially in the southern states, where the plant is cultivated. I take this to be one of the more nutritious of the leguminosæ, and as little apt to occasion inconvenience as most others. I know that a different opinion has been entertained on the subject. But the prejudice against the arachis seems to have arisen chiefly from our often observing the inconveniences produced by it in children, and other very young persons, who devour the kernels without any discretion, and who are often as much injured by the eating of other articles, which are, on all hands, allowed to be among the most innocent and salutary. The mild oil, not perhaps inferior to that of the olive, is largely extracted from the kernels.*]

c. *Nuces Oleosæ.*

These are farinaceous seeds, which have a large proportion of oil in their composition. We have said above, that oil is always a part in the composition of farina; but in many instances it is so intimately united with the saccharine part, that its distinguishing qualities do not appear. Here, however, it does appear, or at least it is very readily by expression or heat separated in its proper form.

In what manner it before existed in the seed, is not very clear. The common opinion is, that even in the seed it existed in a separate state, lodged in certain cells separate from the rest of the substance: but this is not certain; for the eye, even assisted with the microscope, does not discover such cells; and in certain seeds treated by infusion, the whole of their substance is extracted in the form of a mucilage, in which no oil appears separated. The oil here, therefore, in this mucilage, is united with the other parts of the substance, and may have been so while it existed in the entire seed. How indeed, in that case, it can be separated by expression, is not easily explained; but from the considerations just now offered, it

must somehow be done without leading us to suppose the separate existence of it in the seed.

This subject is touched as a piece of chemistry relative to some questions that have before occurred; but it is not necessary to insist farther upon it now: for whether the oil of the Nuces Oleosæ exists in a farinaceous or in an oily state, it will equally answer our purpose in proving, that these kernels are considerably nutritious; and that bulk for bulk, or weight for weight, they are more so than any of the farinacea hitherto mentioned. They are accordingly employed in diet; and in some instances as a considerable part of it. This indeed happens in a few instances only, and chiefly when they are taken in their young and unripe state: for it appears that as they proceed in their growth, it is their saccharine and strictly farinaceous matter that is first produced with a smaller proportion of oil; and that by the further maturation of the seed, the quantity and proportion of the oil is constantly increasing to the utmost it can arrive at. It is thus we may explain the large use that is made of the cocoa-nut or chocolate in the torrid zone.

In other cases, where the oil of these kernels is in large proportion to the other substance, I doubt if they can be employed as food in large quantity, and by themselves, for that purpose. Whatever may be the power of our gastric fluid, I believe it does not operate upon any vegetable substance, unless this substance is at the same time subjected to some degree of fermentation; but oily matters seem to resist this, and are therefore of difficult digestion, lie long in the stomach, and often feel uneasy there. It is true, that oil itself is digested; but it probably is by a mixture with acids previously provided in the stomach, and when at the same time both the oil and acid are in a fluid state. In the case of the oily farinacea, it seems to be the solution that gives the difficulty; and I have known many instances of parts of these kernels being brought up from the stomach by rumination, long after they had been taken down.

Enough is now said with regard to the nature of the oily farinacea in general; and the particulars do not give occasion for much to be said.

The Avellana, the Amygdalæ dulces, and the Juglans, do each of them contain a large, and much the same, proportion of a mild oil, and are therefore very much of the same nature and qualities, whether as food or medicine. It is only to be remarked, that as we said before that these oily kernels are in different states in the progress of their maturation, so they will also differ according

to their climate, giving more or less of that maturity. Thus the Filberts or hazel-nuts of this climate do not contain the same quantity of oil which they do in more southern regions.

These three oily nuts mentioned have each of them a cuticle inclosing their farinaceous and oily matter. This, in the two first, is a powdery astringent substance: and when the kernels are eaten with the cuticle upon them, this adheres to the fauces for a long time after, and excites coughing; which, however, does not at all happen from eating the decorticated seeds.

[*Here it might not be improper to take particular notice of various species of North-American Juglans, both those called walnuts and hickeries. The most delicate and important of these are the juglans nigra, or black-walnut; the j. cinerea, or cathartica, called butter-nut;† the j. olivæformis, or pecan, and the shell-bark hickery, or juglans tomentosa. The kernel of all these nuts is a very nutritious substance; and many preparations of them have long been employed, both as merely *nutrientia* and as real delicacies, by the Indians. The kernel of the pecan is invested by an extremely astringent matter.*]

The Pistachio does not contain such a quantity of oil as the others mentioned; and how they turn out in nourishment I have not learned.

One of the most considerable of the oily farinacea, is the Cacao or Chocolate, which yet remains to be spoken of. How it may differ in its farinaceous part from that matter in the other seeds, I cannot perceive; but it seems to be very intimately blended with the oily part, as it exists in the nut or kernel; and it seems also particulary fit for being united by triture with that oil when it has been anywise before separated. With this farina the oil seems to be in as large proportion as in any other of the oily farinacea; and this oil, while it is equally bland as in any of the others, has this superior quality, that it is much less liable than any of them to become rancid.

From these circumstances it will appear, that Chocolate must be equally nutritious with any other such substance, and perhaps less offensive to the stomach. This substance, however, is not always easily digested, and has sometimes given all the inconveniences in digestion that have happened from the others; but it appears that these inconveniences may be in a great measure obviated by a very diligent triture, uniting very intimately the farinaceous and oily

† Under the head of cathartica, I ought to have noticed the valuable purgative which is prepared by forming an extract from the inner bark of the butter-nut.

part. This seems to be attempted in every preparation of Chocolate for food: but it seems to be nowhere executed so perfectly as at London; where, instead of the levigation formerly practised, it is made to pass between two cylinders rolled against one another. The Chocolate thus prepared can be very equally diffused, and almost dissolved, in water or milk, and that without showing any particles of oil floating separately on the surface; which, however, happens to every other preparation of it that I have seen. It is at the same time to be remarked, that Chocolate is always more easily digested, as its oily and farinaceous parts are, by its preparation, more intimately united together.

To the list of the *Nuces Oleosæ* should have been added the *Semina Papaveris Albi*, or White Poppy Seeds, which, with a portion of farinaceous, contain a large quantity of oily matter, which may be copiously obtained from them by expression. This has precisely the same qualities as the other expressed oils, and has been employed both in diet and medicine as the others have been. It is hardly necessary now-a-days to say that these seeds have not in the slightest degree any part of the narcotic quality which prevails so considerably in the capsules, or as they are called the Poppy-heads, from which they are taken. These seeds have been employed in diet in considerable quantities, without discovering the smallest degree of a narcotic quality, or any other than those of the Nuces Oleosæ we have already treated of.

To the same list of oily seeds might have been added the seeds of the cucurbitaceous fruits, commonly known under the title of the greater Cold Seeds. All these, with a portion of farinaceous matter, contain a quantity of oil, and which gives them a title to be mentioned in this place. They have accordingly been formerly much employed along with almonds in preparing emulsions. There is no impropriety in their employment; but at the same time they have no different qualities from those of the almond, and have certainly no peculiar refrigerant powers to recommend their use. They are therefore now properly omitted in both the Edinburgh and London Dispensatories.

[*A vegetable of as much importance as some of the preceding, is the HELIANTHUS ANNUUS, or GREAT ANNUAL SUNFLOWER. This has for ages been cultivated by the Indians both of North and of South-America. They make bread of the seeds, which contain, along with the farinaceous matter, a large quantity of a mild oil, nearly allied to that of the olive. In general, if I mistake not, the savages

of the northern continent, combined with the meal of the helianthus, a portion of the meal of maize.*]

The oily part of these oily farinaceae separated by itself, is much of the same nature in all the different species, and is much of the nature of the Olive-oil, which is next to be spoken of; and which, as an oil, is more employed in food than all the rest.

Oil of Olives.

Much might be said of this as a medicine; but I am here confined to speak of it as a nutriment only: and if we consider how much oily matter is necessary to the animal system, it will readily appear why so much of oily matter is taken in diet. Besides the quantity of oily matter that is almost always joined and intermixed with our animal food, there is even a part of that, and a very great part of our vegetable aliments, that in our cookery are almost constantly accompanied with oil in one shape or other; and there are hardly any people known that do not make use of oil in its separate state, and who have not made some provision for this purpose. This provision is indeed drawn from different sources in different countries; but it seems to be very nearly of the same nature in all of them: that is, it is a mild and bland oil, with little odour or taste, and very nearly the same as it is found in many vegetables, and in the bodies of almost all animals. At least these oils, when brought to the same degree of purity, are, except in point of consistence, very nearly the same. There will be no difficulty, therefore, in admitting that the unctuous and mild oils of vegetables are suited to supply the human body, either as it grows requiring nourishment, or as upon occasion of waste it may require repair.

As the oil of the human body is collected for the purposes of the œconomy in considerable quantities in particular parts of the body, so it may be, and has been, imagined, that the oil taken into the body is merely to afford or supply the oil of the adipose membrane; and that, as taken in, it continues unchanged both as it passes through the first passages, and even as diffused in the blood-vessels it continues there unmixed till it exsudes through pores in the vessels into the cellular texture. We have endeavoured, however, to give another view of this matter, and to show, that the oil taken into the stomach is at length truly mixed with the proper animal fluid, and makes a considerable part in the composition of it. And agreeable to the other parts of the theory on that subject, it seems proper to remark, that oil and oily matters are, from spontaneous instinct as it would seem, taken in

especially with acescent substances, that is, with the most part of vegetables.

Which of the oils employed in diet are best suited to the purpose, we cannot distinctly perceive; and believe they are all equally proper, if they are equally free from other adherent matters, and from rancidity in themselves.

Whilst the most part of men willingly receive, and digest easily, a considerable portion of oily matters, there are certain persons whose stomachs digest them with very great difficulty, or not at all. I have known several who, in the course of a long life, constantly felt uneasy from taking in any oily matter, and therefore avoided them very entirely; so that I have known a woman of fourscore years who had hardly ever tasted butter. I have also known several persons who, at certain periods of their lives, could not find that oily matters, though taken down without aversion, were truly miscible with the other fluids of the stomach, but were ready to be thrown up by eructation in the same oily state they had been taken down in, and pretty entirely separated from the matters which they had been very intimately mixed with in diet.

There is also this considerable difference in using oily matters, that some persons can take, and readily enough digest, a portion of these, though they have contracted a good deal of empyreuma, and though they have acquired a good deal of rancidity; while many other persons, though they can take oily matters very freely, are, however, very ready to find them indigestible, if tainted with any degree of empyreuma or rancidity.

I thought it proper to mark these differences in the digestion of oils; but how they may be explained or accounted for I cannot find. We have of late had the existence of a gastric menstruum very well ascertained; but the causes of its different operation in different animals, and in different men, are by no means yet explained. Upon the supposition of this menstruum, and of its solving powers in general, I have endeavoured to assign the qualities of several different aliments; but the many differences of these which appear in different men, I do not pretend almost in any measure to account for.

With respect to the different digestion of oils just now mentioned, I will add an observation, which, though it does not relieve any of our difficulties, is a matter of fact, and therefore to be marked. In several of the persons who could not find oils readily miscible with the other fluids of the stomach, I have found at the same time that their stomachs abounded with acid to an

uncommon degree. What effect this may have, or if it may have any at all, upon the doctrine I have maintained above, that acid is a chief means of uniting oil with the other parts of the animal fluid, I leave my speculating readers to determine.

After the other vegetable aliments, I have set down the chief species of the *Esculent Fungi*;* and as this country does not afford any variety of these, I have not experience enough to mark any different qualities that may appear in the several kinds: but what I have to say in general with regard to them deserves attention. If they are truly vegetable matters, which some have doubted of,† they are truly different from every other vegetable that we are acquainted with: for in the first part of their distillation, without addition, they give out no acid, but a large proportion of volatile alkali; and exposed so as to undergo a spontaneous fermentation, they show no acescency, but become immediately putrid. By these two circumstances, ascertained by our own experiments, they show a very near resemblance to the nature of animal substances; and from thence their qualities are to be judged of. They seem nowise suited, as vegetable substances so universally are, to be joined with animal substances, with a view to obviate and moderate the tendency of the latter to putrefaction; and we also presume that they are more considerably nutritious than almost any truly vegetable substances are.‡

I here meet with a mistake made in the catalogue given above, owing to my hastily copying the catalogue that was inserted in the spurious edition of my lectures. There, after the *Cibi ex Vegetabilibus*, was inserted the sections of *Potus* and *Condimenta*; but it will be obvious that they ought to have been postponed till the whole of the aliments had been considered: and therefore I am now to follow that measure.

* To this list I might have added several species, natives of the United-States: but I have contented myself with mentioning one, viz. the tuber-tucca, already spoken of.

† Some late writers have revived the notion, that the fungi are more properly subjects of the animal than of the vegetable kingdom. The chemical analysis of these productions is not so essentially different from that of some acknowledged vegetables as Dr Cullen seems to imagine.

‡ I greatly doubt if the fungi, to which the professor alludes, be so highly nutritious as he supposes. They are, indeed, a very stimulating food, and may, I think, much more properly be referred to the *condimenta* than to the *nutrientia*. I have little doubt that one pound of the meal of zea, oryza, or even triticum, will give more nutriment than two pounds of the common fungi, used at our tables.

SECT. II.

Of ALIMENTS *taken from the* ANIMAL KINGDOM.

THESE are somewhat different, as they are taken from one or other of the six classes of Mammalia, Aves, Pisces, Amphibia, Insecta, and Vermes; into which naturalists have now agreed to divide the whole subjects of the animal kingdom: and I shall now therefore consider the animal aliments as they are taken severally from these classes.

§ I. *Of* ALIMENTS *taken from the class of* MAMMALIA.

OF this class there are two orders, the *Primates* and *Cete*, which we shall not take any further notice of as alimentary: for though even the first among certain people may be such, and more certainly the latter is frequently such among many; yet as these are hardly used among civilized people, as we are almost entirely unacquainted with the use of them, and have no information with respect to them that can be depended upon, we shall take no further notice of them in this treatise.

Here we shall confine ourselves to the consideration of the aliments taken from those other orders of the Mammalia which by naturalists were formerly comprehended under the title of Quadrupedia.

Of many of these quadrupedia we use the milk which the females of certain orders afford, as a frequent part of our aliment: and as this is commonly and justly held to be of an intermediate nature between the entirely vegetable and entirely animal aliments; so it seems proper in passing here from the consideration of the one kind to that of the other, to give some attention, in the first place, to this intermediate or mixed kind of aliment.

ARTICLE I. *Of Milk.*

WE should perhaps begin this subject with explaining the manner and occasion of the production of milk in the female sex; but we reserve that till we shall have considered the nature of this fluid, as it may be ascertained by observation and experiment.

In doing this, we must limit ourselves to the consideration of those milks only which are used as aliment in this country: for although in other countries other milks are used, we have not sufficient information to enable us to speak distinctly concerning them. The milks, therefore, to be here considered are those

of *Women*, or of the domestic animals, *Asses*, *Mares*, *Cows*, *Goats*, and *Sheep*.

These milks seem to have properties much in common with one another, in as far as they consist of parts which are nearly of the same nature in each; and the difference of milks seems to depend chiefly upon the proportion of these parts to the whole, and of the several parts to one another. It will therefore be allowable, and even proper, to begin with the consideration of milk in general.

Milk, as it issues or is drawn from the vessels of the female that affords it, appears to be a homogeneous liquor; but after it has remained for some time at rest in the open air, it discovers itself to consist of different parts or substances, into which it spontaneously separates, and which are constantly found to be an *oily*, a *coagulable*, and a *watery matter*; or as they are vulgarly known under the names of Cream, Curd, and Whey. We are here to consider these parts in the order we have now mentioned them.

The ordinary circumstances of this separation, so commonly occurring under our eyes, need not be described here; but as it may be considerably varied by the circumstances in which the milk is exposed or kept, as well as by various artifices that may be applied to it, we shall, in considering the several parts, take notice of the several circumstances and artifices affecting the separation of them, and of the differences thence arising in the parts when separated.

We begin with the consideration of the oily part of milk, which is commonly the first that is spontaneously separated. When milk is drawn from the female animal that affords it, if no coagulating power is applied to it, and it is allowed to remain at rest for some time, it has a part spontaneously separated, which floats upon the surface of the whole, appears of a thicker consistence than what remains below, and is manifestly of an oily or unctuous nature. This is commonly known under the name of Cream: And though the separation of it will take place in close vessels, it takes place more quickly and completely if the surface of the milk be exposed to the air; and in larger quantity if it be exposed by a large surface, over which a gentle stream of air is constantly passing. The influence of the contact of air appears further from this, that as the cream first formed interposes a dense layer between the air and the body of the milk, more cream can be obtained from a given quantity of milk, if as soon as a layer of cream is formed it be ta-

ken off from the surface, and thereby a new surface be freely exposed to the air.

It seems also to be a measure for expeding and increasing the separation of the oily part, if the milk soon after it is drawn from the animal, be made to boil over the fire. By this a great quantity of air is detached from it; and the intumescence of the milk, which always appears upon this occasion, shows that the whole body of the milk is in every part of it greatly agitated. The theory of this effect of boiling is not very evident; but it seems to depend upon this, that the oily parts of milk are very minutely diffused among the other parts of it, and connected with them by the attraction of adhesion: but as the attraction of the oily parts towards one another should be still greater than towards the other parts of the milk, it is perhaps only necessary by some agitation of the whole to bring the oily parts in contact with one another, in order to unite them together, and thereby make them separate themselves more readily and copiously. I expect this will be found to be the theory of the manœuvre by which butter is commonly procured from cream, as will be mentioned hereafter.

The separation of cream is much affected by the state of the milk in its progress towards the other separations that are to take place. As after some time milk becomes acid, and not long after is coagulated into one mass; so, as the acescency proceeds, the separation of the cream is in some measure interrupted, and upon the coagulation taking place it ceases altogether. It is therefore that as the acescency and coagulation are hastened in warm, and retarded in cold, weather; so, according to the state of the weather, the production of cream is greater or less. As thunder, and a certain disposition in the air to produce that meteor, is found to hasten the acescency and coagulation of milk; so this explains the effects of thunder, and of a certain state of the air upon the separation of cream.

The proportion of the oily part in milk depends upon different circumstances in the state of the animal affording it. There is undoubtedly in certain females a peculiar constitution disposing them to give a greater proportion of oil in their milk than other animals of the same species do, though both the one and the other be precisely in the same circumstances. What this depends upon is not clearly perceived. It may, and certainly in some measure does, depend upon the peculiar constitution of the animal: but it appears most frequently in animals bred in particular places, as the Isle of Alderney, the climate and soil of which I do not exactly

know; but we are certain that it is constant in animals bred and reared in mountainous countries, such as the mountains of Swisserland and the Highlands of Scotland.

The constitution, however, of animals being given, various other circumstances give a different proportion of the oil in their milk. It is commonly greater as the age of the animal is more advanced, or as the animal is longer after its delivery: and especially it is greater as the soil of the pasture ground is drier, or as it has been for more years in pasture; and, on the contrary, as the soil is moister, and as the herbage is more succulent, the proportion of oil is diminished.

The proportion of the oily part of milk being thus ascertained, we have next to observe, that as it is at first separated in the form of cream, this, besides the proper oily part, always contains a certain quantity of both the coagulable and watery parts of the milk. From these the oil is to be separated by an agitation which we call Churning; and by which it is obtained in the form of what we call Butter. The theory of this operation we have hinted above; and as the process succeeds without the escape of air, or other mark of any fermentation, and succeeds under the admixtures of various substances, it is probable that it depends upon the agitation alone operating in the manner we have said: And the theory of it seems to be confirmed by its explaining at the same time the effects of boiling, which in the Devonshire practice allows butter to be procured from cream with much less agitation than is in other cases necessary.

As we have now considered the means by which the oily part of milk is obtained very much in its separate state, it is time to consider its nature and peculiar qualities.

This oil, in its recent state, is very much of the nature of the expressed and unctuous oils of vegetables and that of animal fats, both in its sensible qualities and as examined by a chemical analysis. Butter is more consistent than the most part of vegetable oils, owing we suppose to a mucilaginous matter adhering, which seems also to adhere to those oils; but here probably the mucilaginous or caseous part of milk adheres more firmly, on account of the acid of milk also adhering. Butter, like the other mild and fat oils, is liable to a change which we call Rancidity, in which it acquires a peculiar odour and taste, very commonly known, and as quite *sui generis* not to be described. Wherein such a change consists is not yet well explained. It seems to depend upon a change, not in the proper oil, but in some of the matters adhering to it: for but-

ter not well freed from butter-milk more readily becomes rancid than that which is more entirely separated from it; and butter by being melted and freed from a deposit which it makes on being kept in a melted state for some time, may be thereby longer preserved from rancidity; and in that case also it becomes of a more fluid consistence: all which I think implies, that it is now a more pure oil than it was before.

What is the nature of the matter which may be thus separated from butter, and is the proper subject of rancidity, it is difficult to determine: but that it is in part an acid, I judge from the rancidity's being promoted by the adherence of butter-milk; and from hence also, that rancid butter readily corrodes copper, which it did not in its recent state. Along with this acid there is manifestly also a mucilaginous matter; and it seems to me, that in both these matters together a fermentation takes place, and gives the rancidity in question. This peculiar fermentation, however, is still little understood; and till it is better known, we cannot find what is very much to be desired, the means of obviating the rancidity of butter, and of other fat oils. In the mean time, the only means we know of that may be employed for butter, is the separating its acid and mucilaginous parts, and the application of sea-salt. If we employ a very perfect salt of this kind, we need to employ only a small quantity of it; and if at the same time we assist its antizymic power, by adding a small proportion of nitre and sugar, we may thus preserve butter very long in a condition fit to be used as an aliment.

After the oily, I am now to consider the Coagulable part of milk. In a few days after milk has been taken from the animal that affords it, the cream is in that time separated from it, and the remainder is spontaneously coagulated into a soft but somewhat consistent mass, comprehending the watery parts of the milk, which are always at the same time in an acid state; and indeed this acid state almost always precedes the coagulation of the whole.

In some time after the coagulation is formed, the watery part separates from the properly coagulated, so that this may be collected more entirely by itself; and in that state it is frequently used in diet: but it is never collected, or attempted to be brought, into a solid form, so as to get the appellation of Cheese. The spontaneous coagulum of cream is sometimes employed to give a species of cheese: but every other species of cheese is made by an artificial coagulation: that is, by the addition of a coagulating matter, either

to entire milk immediately after it is drawn from the animal affording it, or to milk after the cream has been separated from it, but before the spontaneous coagulation had come on. The coagulating matter employed for this purpose is named *Runnet;* and it is commonly produced by filling the fourth stomach of a calf with milk, which is there coagulated; and the stomach, with this coagulum included, is preserved for use in salt and water. The ordinary management and employment of this I need not take notice of; but it is very proper to observe, that the ordinary preparation of it has given occasion to a supposition that the coagulating power of it depended upon the acidity that was found in the stomach of the calf, and communicated to the milk that was poured into it: but Dr Young's experiments show clearly that the coagulating power of runnet does not depend upon that acidity, but is a quality residing in the substance of the stomach itself, as well as in the stomach of many other animals, and in many other substances the most remote from any suspicion of adhering acidity.

These experiments indeed leave us much at a loss in judging upon what the coagulating power of runnet, and of many other substances which may be employed as such, do really depend; and the whole of this business must be left uncertain till more experiments shall be made. In the mean time, it is enough to our purpose to observe, that the cheese which is used as an aliment is always made by the use of the ordinary runnet; and therefore that nothing distinguishes the qualities of the cheese made, but the kind and qualities of the milk of which it is prepared, and the various circumstances and practices which take place in the preparation of it. But before entering upon the consideration of the several species of cheese, I must say something of the nature of cheese in general.

A quality belonging to every species of cheese is, that it is liable to putrefaction; and by this it may be said that it approaches to the nature of animal substances. This opinion is confirmed by the matter of which cheese is formed, being, like animal substances, coagulated by acids, alcohol, and heat. It is true that the two latter, and even the mineral acids, do not act upon the coagulable part of milk in the same circumstances and in the same manner as they do upon the serum of animal blood; but still they do act upon milk in a manner that shows a great similarity of the two subjects. The animal nature of cheese is especially confirmed by its yielding in distillation a volatile alkali. This indeed is a disputed fact; but I assume it upon the authority of eminent chemists, and upon

actual experiment made under my own eye. A pound of skimmed-milk cheese, not in the least affected by putrefaction, yielded in distillation, first, a very pure water, very slightly acid; secondly, a liquor which effervesced strongly with the mineral acids; and, thirdly, there came over an alkaline salt, concreting every where on the inside of the receiver; and, in the last place, an empyreumatic oil.

Upon the whole, therefore, I conclude, that cheese, or the coagulable part of milk, is very much of the nature of animal substances; and if we shall adopt the common opinion, that milk is especially formed of the chyle or newly taken-in aliment, we shall readily perceive that this must be always blended with the lymph which it meets with in its passage through the lacteals and thoracic duct; and we shall then also admit that this lymph makes a part, and particularly the coagulable part, of milk. We judge, therefore, that milk is properly supposed to contain a portion of animal matter; and at the same time, that the milk of animals feeding wholly, or for a great part, on vegetables, may be justly supposed to be an aliment of an intermediate kind between vegetable and animal.

This is our doctrine with respect to cheese in general; but it is now to be remarked, that cheese as employed in diet is of very different kinds. We have said already, that cheese is hardly ever made of the substance formed by the spontaneous coagulation of milk, and at least only in the case mentioned above. In all other cases, cheese is formed of curd produced by the application of runnet; and the cheese thus produced is distinguished in the first place by the condition of the milk it is made of. Thus the runnet may be applied to entire milk as it is drawn from the animal affording it; or it may be applied to that milk after it has been previously deprived of its cream; or it may be applied to the cream separated from the watery parts of the milk; or it may be applied to a portion of entire milk, to which is added a quantity of cream taken from another portion of the same milk: from which especially a considerable difference of cheese may arise from the different proportion of the coagulable and oily parts in the milk employed. Lastly, the milk employed may be that of one animal only; or it may be a mixture in different proportions of the several milks employed in our diet, but especially those of cows, goats, and sheep, the only milks from which cheese is prepared in this country.

Besides these differences of cheese arising from the state and quality of the milk employed, there are many other differences aris-

ing from the various practices employed in preparing it; as by the different circumstances of the coagulation; by the management of the coagulum or curd; by the pressure given to it; by the salting and drying; and by the manner in which it is afterwards preserved. These considerations will show the very great variety of cheese as it is presented upon our tables: but I am not able to explain all the causes of this variety; and it does not appear necessary to attempt it, as they relate more to œconomy and taste than to our present purpose of considering it as an alimentary matter.

This we shall consider after we shall have treated of all the several parts of milk; and at present shall touch only upon a curious question with respect to the variety of cheese.

Cheeses are commonly distinguished by the different districts of the country producing them, and in many of which they are often of a peculiar kind. From what has been already said, it will readily appear that the practices of different countries may differ very considerably, so as to give a different state of the cheese produced: and for the sake of the particular qualities they may possess, or at least for the purpose of accommodating them to particular tastes, it might be desired that the practices of different countries should be ascertained, so that they might be occasionally imitated. This, however, is extremely difficult; and the reason of it seems to be, that when in any manufacture the circumstances of the materials, and the practices employed in working upon them, may be greatly varied, it must be almost impossible for any two persons who have not often operated together, to take exactly the same measures in every step of a long process.

Having thus suggested what seemed to be proper at present concerning the caseous part, it remains now to consider the third ingredient in the composition of milk; that is, the watery part, or, as it is commonly called, the Whey.

A pure alimentary water is always a very considerable part of milk, as appears when we consider it according as it is either spontaneously or artificially separated from the other parts of the milk, or when after it is separated we examine it by evaporation, applying such a gentle heat as can hardly volatilize any other matter but the pure water. In such cases, both from Hoffmann's and from Young's experiments, it appears that the water is at least seven-eighths of the whole milk.

From hence it may be observed, that milk is always to be considered as a very liquid aliment; but it is at the same time to be remarked, that this is not equally applicable to the different kinds

of milk: for although the proportion of oily and coagulable parts be considerably different in different milks, yet the proportion of the watery part is not so much varied. The residuum of four ounces, after evaporation, of cows and womens milk is very nearly the same; as in the former it is three drams and thirty-two grains, in the latter three drams and thirty-four grains.

The watery part separated from the other parts of milk is different according to the state of the milk from which it has been separated: but under whatever circumstances separated, this watery part is always found to hold dissolved in it a quantity of matter which is different in kind, and different in proportion, according to the state of the milk at the time of the separation of the watery part.

When the watery part is taken from new milk coagulated by runnet, and when we especially name it Whey, it always contains diffused in it a considerable quantity of the oily and caseous parts, which by certain practices can be again separated from it. When whey is separated from skimmed milk, or that which has been previously deprived of its cream, it still contains a quantity of the caseous part, but less of the oily. When the watery part of milk is separated from the oily by churning, we name it Butter-milk; and it then contains a large proportion of the caseous part, with very little of the oily. Lastly, the watery part may be separated either from entire or from skimmed milk, in consequence of spontaneous coagulation; and in this state it is always acid, and at the same time is the most entirely freed from both the oily and the caseous parts. In these different states, the qualities of the watery parts of milk as an aliment shall be taken notice of hereafter.

Having thus mentioned the different states in which we obtain the watery part of milk, we now return to consider it in that state in which we most commonly employ it, that is, as it is obtained from entire milk, in consequence of its coagulation by runnet. In this state it is different according as the milk is taken from different animals, and not always in proportion to the contents of the several milks in their entire state. Thus, as cows milk seems to contain a larger proportion of oil than that of goats, it might be supposed that the whey of cows milk should contain more oil than that of goats milk: but the contrary appears to me to be the case; and it seems to depend upon this, that the oil of goats milk does not so readily separate itself from the watery parts as it does from that of cows, but remains more tenaciously adhering to it, and therefore to be more copiously separated with the whey.

Besides the oily and caseous parts which we have mentioned to be always contained in whey, it contains also a saccharine matter, which may be separated from it by various processes practised either on the milk or on the whey, and now very commonly known. The matter obtained by these processes is a genuine sugar, and differs from that of the sugar-cane only by its having some of the oily or caseous parts of milk adhering to it, but from which it may, by repeated solutions and crystallizations, be entirely freed, and thereby be brought to the same degree of purity as any other sugar.

Whey, as containing this sugar, is capable of a vinous fermentation, and consequently of affording by distillation an ardent spirit.

It is by the presence of the same sugar that whey so readily enters into an acescent fermentation, and becomes acid in the several circumstances mentioned above. It appears that this acid, by being kept for some time, becomes more considerably acid, and probably an acid of a peculiar kind; though, so far as I yet know, it has not been chemically examined.

Having now considered the several parts of which milk in general consists, it will be proper, in the next place, to inquire in what proportion these parts are to be found in the several milks employed in the diet of men in this country.

These milks are those of ewes, goats, cows, mares, women, and asses; the three former being those of ruminating, the three latter of non-ruminant, animals: a distinction which I mark, though I cannot explain in what manner the circumstances of ruminating or not ruminating affects the state of the milk.

To mark in these milks the proportion of the several parts, I follow the experiments of Dr Young; and, according to him, the proportion of the caseous part is in the order I have just now given them, greatest in the first and less in the following, and that in the order above stated. It is evidently considerably greater in the ruminant than in the non-ruminant animals. In the former it may be pretty exactly ascertained; but in the latter with much more difficulty: And it appears to me that many more experiments than have yet been made are necessary to ascertain the circumstances which affect their coagulation, and consequently the proportion of their caseous parts.

The proportion of serous parts, as might be expected, is mentioned by Dr Young to be inversely that of the caseous part in the order above mentioned, as will appear from his Table, page 59.

But it might be supposed also that the serous parts should be in the same proportion as the watery parts found by evaporation: but we doubt if the experiments on this subject be sufficiently exact; for there is some difference in the account Dr Young gives of the residuum after evaporation of the several milks, at the end of Sect. 3. of Chap. viii. from the particular experiments given in the former part of his work.

The proportion of the oily part is greatest in the milk of ewes, next in the milk of cows, and less in that of goats; but I judge it difficult to determine this, as the oily part of goats milk does not so readily separate itself as in that of cows from the other parts. In the non-ruminant, womens milk seems to contain more oil than the milk of mares or asses: but this does not seem to depend so much upon the difference of constitution as upon the difference of diet; for women commonly take in more of oily matter than mares or asses do: and I know from experiment that the proportion of oily matter is much diminished by their being confined strictly to a vegetable diet.

We have thus stated the proportions of the several parts of milk in the several kinds of it, nearly as it has been ascertained by experiments already made; and the proportions here assigned, may, I trust, be assumed in any reasonings we may enter into upon this subject: but before quitting the subject we must observe, that in comparing the milk or milks of two different animals, the experiments already made cannot be of the utmost exactness; for as the milk of every individual is varied by peculiarity of constitution, by the age of the animal, by the distance of time from delivery, and by the difference of diet; so in comparing the milk of two different species, unless the two individuals are taken exactly in the same condition with respect to the circumstances just now mentioned, the result cannot afford any general rule with respect to the two species. I give an example: Ewes milk, though it commonly affords more cream and butter than that of cows, yet I believe there may be found an Alderney cow whose milk will give more cream and butter than that of any ewe.

The same consideration will perhaps account for some difference that is to be met with in the experiments of Dr Ferris from those of Dr Young, with respect to mares and womens milk: and it is to be remarked, that womens milk is more varied by the state of diet than that of any other animal whose milk we employ; and particularly, that this renders the rank which womens

milk holds in the tables of YOUNG and FERRIS to be a little uncertain.

Having thus considered milk in general, and also in the several kinds of it, we may now proceed to consider in what manner this liquor is produced in the female sex. The question might first be, How it happens to appear for the first time in a certain circumstance of the female body, that is, immediately after the production and delivery of their offspring? But we choose to delay this question till we shall have first considered in what manner it is produced during the whole of the time that the female continues to afford it.

The common opinion on this subject is taken from the seeming resemblance of the milk to the chyle, into which our aliments taken into the stomach and intestines are always converted before they pass into the blood-vessels; and from this resemblance it has been supposed that the chyle, without being mixed with the other parts of the blood, is directly carried to the mammæ of females, and appears there in the form of milk.

This doctrine, however common, we cannot admit of; and think it is founded upon, and has in its turn produced, several errors in physiology. In the first place, we cannot admit that the chyle, after passing into the blood-vessels, remains for any length of time unmixed with the other parts of the blood; and in the observations which assert its having been found soon after the taking in of aliment appearing in a separate state, I judge there has been much mistake, and that some other appearances of the blood have been mistaken for chyle, as we know to have happened in many instances: or if it be possible that in certain cases the appearance of chyle has been real, it is certainly not the ordinary course of the animal œconomy; for there have been innumerable instances of blood drawn from the veins at various intervals after the time of taking in of aliment, without its exhibiting any such appearance. It is indeed almost impossible that it should take place. The chyle does not pass into the subclavian vein but in a great length of time; and therefore in a small quantity only at once, and is therefore immediately blended with a large proportion of blood. This diffusion increases as the whole is carried to the right ventricle of the heart; and in this, as well as in the subsequent passage through the lungs and left ventricle of the heart, the whole is acted upon by powers which must blend and diffuse the chyle in the most minute and intimate manner amongst the parts of a highly-coloured fluid. This must render it almost impossible, that

in any part of the arteries or veins the chyle should afterwards appear united in one mass, and of its own proper colour, unless it could be shown that upon the stagnation of the blood, there was a power disposing the chyle to separate itself from the other parts of the blood, which is not alleged; nor could it possibly have existed without showing an appearance of chyle in many instances of extravasation, when, however, it certainly does not.

The supposition, therefore, that milk is especially afforded by the chyle in the same condition as it is received from the thoracic duct into the blood-vessels passing to the mammæ of females, and there giving the same matter and qualities we perceive in milk, is very ill supported by the notion of the chyle's remaining separate from the other parts of the blood for some time after it has been taken into the blood-vessels. How much soever of the aliments recently taken in we may find going to the production of milk, we shall find it very improbable that chyle takes that course in the same form and in the same crude state in which it enters the blood-vessels; and we shall find it much more probable that milk is produced in the mammæ of females by the peculiar, though mysterious, powers of secretion.

But although milk be not the same fluid which passed from the thoracic duct into the subclavian vein, there are many arguments which lead us to suppose that the matter of milk is chiefly afforded by the matter of the chyle, or of the alimentary matter last taken in. These arguments, however, are commonly employed very incorrectly, and carried too far. One argument employed upon this subject is, that the peculiar odour of the aliments last taken in often appears in the milk which is soon after secreted: and this, although it is in several instances true, is by no means universally so: for I have known many instances of nurses taking in a quantity of odorous matter without its appearing in their milk; and even if the appearance more universally took place, I cannot hold it as a proof of any considerable portion of the aliments taking that course. Certain odours are wonderfully diffusible, and often appear when no great quantity of the matter affording them is present in the same place: And we might here employ the same reasoning as we did before with respect to asparagus in the unrine; and therefore argue, that the odour of aliments being perceived in the milk secreted soon after, affords no proof that much of the matter of the aliment had taken that course.

But it is alleged further, that other qualities often appear in milk, which show that a great portion of the particular matter of the ali-

ments had contributed to the production of that fluid. This may perhaps in some instances be well founded; but I suspect that the facts alleged to this purpose have been much exaggerated. It has been, for example, alleged, that purgatives given to a nurse have affected her suckling; but Dr Young, although intent upon the inquiry, never found this to be so: and I am certain that in fifty instances that I have known the child was not affected by purgatives given to its nurse;* and though in some instances it should have been so, considering the subtle and small portion of matter in which the power of purgatives often resides, I would still think it a weak proof that a great part of the aliment constantly took that course. That the particular qualities of aliments do not always affect the milk secreted after their being taken in I know from this, that many nurses take in considerable quantities of intoxicating liqour, and are themselves intoxicated by it; but I have not known any instance of the intoxicating power being communicated to their suckling.

One of the strongest arguments for proving that the aliment lately taken in contributes especially to the production of milk, seems to be, that the quantity of milk secreted is always considerably and immediately increased upon the taking in of aliment; and that if aliment at any time has not been duly taken in, the secretion of milk is evidently diminished. All this is true; but it appears especially with respect to the liquidity of the aliment: and that a quantity of liquid taken into the body should increase every secretion will be readily understood; and particularly that it should increase the secretion of milk, which consists of such a large proportion of water, is sufficiently obvious. Every body knows that the enabling a nurse to afford a large quantity of milk, depends much more upon her taking in a large quantity of drink rather than of solid food. How much the secretion of milk depends upon the supply of liquid, I have learned from a particular phenomenon. I have known nurses who have been for the time quite free from thirst, but upon a child's being put to their breast, and beginning to suck, they were immediately affected with a considerable degree of thirst. This I would consider as an institution of nature, showing the sup-

* Unless I have been greatly mistaken (and the contrary experience of such writers as Cullen and Young ought to make me somewhat diffident of the correctness of my observation), I have often, in my practice, met with instances of suckling children considerably affected by purgatives, taken by the nurse. I have thought, that effects of this kind especially occurred, when the cathartic had acted slowly and inconsiderably upon the nurse.

ply of drink to be especially necessary to the supply of milk. Upon the whole, therefore, I cannot find the increase of the secretion of milk by the taking in of aliment to be any proof that much of the solid matter of the aliments, or any entire portion of the chyle, goes immediately to afford that secretion.

I have thus endeavoured to correct the mistaken notion of the chyle, such as it was received into the blood-vessels, affording immediately and very entirely the matter of milk. But although I have rejected some, and endeavoured to weaken others of the arguments employed upon this subject, I do not mean to reject entirely some of these arguments from our consideration. After all I have said, milk, besides water, contains a portion of other matter; and we must say from whence this is drawn. The oily and coagulable parts may be drawn by secretion from the mass of blood in almost any state of this; but besides these parts, there is a saccharine matter which very rarely appears in any part of the mass of blood, and may with confidence be presumed to be afforded by the saccharine matter of our vegetable aliments, while they remain for some time unassimilated to the proper animal fluid.

I own there may be a fallacy in this reasoning, as the disease of diabetes has shown that the powers of the animal œconomy can either produce or extract from our aliments a larger proportion of sugar than usual, and also preserve it longer in an unassimilated state: so we do not well know what effect this power may have upon the secretion of milk, till we shall meet with what has not yet occurred that I know of; that is, a woman in milk affected with diabetes.

Laying aside, however, this speculation, thrown in here as somewhat curious by the way, I go on to say, it is sufficiently probable that the saccharine matter of milk is taken from the saccharine matter of vegetables, as it has recently been taken in, and yet remaining in an unassimilated state: for we every day observe that the quantity of milk in the breasts of women is increased by the taking in of vegetable aliments. That the taking in of vegetable aliment is absolutely necessary to produce such an acescent milk as we commonly find in the breasts of women, we learn very clearly from Dr Young's experiments upon bitches. A bitch fed with vegetable aliments alone, afforded a milk acescent and spontaneously coagulating, like that of the ruminating animals; whereas the same bitch for a little time fed entirely with animal food, afforded a milk manifestly alkaline, and not spontaneously coagulating. The application of this in practice we shall consider hereafter; but

for the present it is enough to observe, that these experiments plainly show that in animals, such as women, using a promiscuous diet, the state of the milk produced will be very much more acescent or alkalescent according to the general character of the diet; but in animals using a vegetable diet alone, I can hardly conceive any other difference to arise than that of a greater or lesser quantity; and we do not imagine that any substances purely medicinal can in that respect have any effect.

The organs of secretion in animal bodies are curiously adapted to one specific secretion; and so much to that alone, as hardly to admit of any other matter unsuitable to that, to pass through the organs of it. There are indeed instances of these organs transmitting matters which should not make a part of their proper secretion; but these exceptions are so much fewer than might be expected, that they only serve to confirm the general rule. We have just now several instances of the breasts of women rejecting matters not suitable to form milk, sufficient to show that the common supposition of the ready passage of such matters to the mammæ must be ill founded. The goat is a multivorous animal, and some vague notions have been formed of the qualities of its milk and whey from this variety of its food; but I can say from much experience, that a difference in the state of its milk is very rarely to be observed: and upon the whole we would allege, that the projects of Galen and Hoffman for impregnating the milk of cows or asses with medicinal substances, are improbable and frivolous attempts towards refinement.

The general qualities of milk, and the different states of it which may take place in the several species of animals, or even in the same individual at different times, being now considered, we proceed to what is especially our business here, to treat of the use of milk as an alimentary matter.

In entering upon this subject, what first presents itself is the use of milk as the proper nourishment of the new born animals of the class of mammalia. In what manner it is adapted to the whole of these, I dare not attempt to explain; and must confine myself to the consideration of the new-born offspring of those animals which afford the milks employed in the diet of this country, and very much to the consideration of what relates more especially to the human species.

The first production of milk being always at the same time with the production of the offspring, and with this of the organ affording milk provided with teats, or parts suited for sucking, and the

new born animal being instinctively directed to, and instructed in, sucking, leaves no doubt that the milk produced is particularly intended for, and adapted to, the nourishment of the new-born offspring; and we are now to attempt explaining more particularly how it is adapted to that purpose in the human species.

On this subject the physiologists have satisfied themselves very easily, in saying, that as chyle affords milk, so milk affords chyle, without the assistance of the digestive organs, which, as they have not been before exercised in it, may not be immediately prepared for their function. But as we have shown that the former position is not true, so we judge the latter to be no better founded. It seems probable that milk does not enter the lacteals in the same state in which it had entered into the stomach: for it appears that milk taken into the stomach is by a runnet applied to it always coagulated there, and therefore needs the solvent power of the gastric fluid to bring it again into a fluid state: and it appears also probable, that milk becomes more or less acid in the stomach; and therefore that a certain combination with animal fluids is necessary to put it into that condition which chyle is always in when it enters the lacteals. Milk, therefore, taken into the stomach does not by itself become chyle; nor is it by its being already prepared chyle that it is fitted for the nourishment of new-born children. We must, therefore, seek for another answer to our question; and there seems to be one very obvious, though not hitherto taken notice of by the physiologists.

Whilst the fœtus or beginning animal remains in the womb of the mother, the whole of its fluids are the same with those in the vessels of the womb from which they are drawn, and are therefore as fully in an alkalescent state as the human œconomy admits of; but we know also, that even in adults this state of the blood, unless it were obviated by the excretion of the more alkalescent parts, and by the taking in of fresh and less alkalescent aliment, would soon pass into a vitiated and dangerous state. But the blood of a new-born child is in the condition disposed to such a change; and it is therefore necessary to give it a supply of aliment, and of aliment not quite alkalescent. Vegetable aliment in this view might seem suited to the purpose; but it is probable that an aliment of this kind would neither be suited to the powers of digestion, nor immediately accommodated to the state of the infant vessels, adapted hitherto to a fully alkalescent blood. An intermediate nourishment, therefore, that may introduce the change by degrees, seems to be necessary; and such an intermediate aliment is milk.

We do not discern with any precision the different states of the alkalescency in the blood of different animals; but we presume that it is more considerably alkalescent in the entirely carnivorous animals than it is in the human species, living partly on animal and partly on vegetable aliment. A certain lower degree than of the most alkalescent state of the blood seems to be suited to the functions of the human œconomy; and from hence it is that man is instinctively directed to the use of vegetable aliments.

For purposes, however, which we cannot clearly explain, the vessels of the fœtus are first filled with as fully alkalescent blood as it is in those of an adult: but to bring the blood into, and preserve it in, that state which is best suited to the functions of the human œconomy, it was necessary to introduce a vegetable aliment into the infant; and accordingly we find, that even for the first years of life health is best provided for by a large proportion of vegetable food. So considerable a change, however, could not be safely made in an infant but by degrees; and therefore for some months of infancy such a mixed aliment as that of milk was the most proper. All this is confirmed by our experience of the inconveniences that have attended all the attempts to introduce very early the large use of entirely vegetable aliment.

We have thus endeavoured to explain why milk is especially suited to the nourishment of new-born children; and hardly any body has ever doubted of it, but the so frequently whimsical VAN HELMONT. Of late Mr BROUZET has bestowed an attention on this opinion of VAN HELMONT which appears to me to be equally frivolous and ill founded.

While milk is judged to be the proper nourishment of new-born animals, there can hardly be a doubt, that to every new-born animal the milk best adapted to it must be that of the species it belongs to, and consequently that of the mother who had immediately produced it.

The reasonings on this subject employed by Mr BROUZET appear to me very unsatisfactory, and often erroneous; but as his opinions have not, so far as I know, prevailed among the learned, it does not seem requisite to bestow here the time and pains that might be necessary to correct them.

How long this nourishment is the best adapted to infants, it is difficult to determine; but the very purpose of multiplying the species shows that nature has set some limits to it. So far as we can trust our observations on the human species, we find inconveniences from either too short or too long nursing: and it appears

to me that either less than seven, or more than eleven, months, is generally hurtful; so that the ordinary practice of nine months seems to be well founded. From some accidental circumstances this measure may be safely varied; but what are the circumstances of the infant's constitution that require it to be varied more or less has not, that I know of, been properly ascertained. The making it somewhat longer than the usual term is the safest; but I am persuaded that long nursing contributes to increase the disposition to rickets; and wherever children are slow in their teething, it seems improper to protract their nursing.

Having thus determined as well as we can the length of time that is most proper to employ the mother's milk, another question arises, How long it is proper to employ that alone, or how soon it is proper to employ an aliment of another kind? It has been already observed, that the very early introduction of vegetable aliment is improper: and we are persuaded that it cannot be introduced with safety for some months after the birth; but for how long precisely we dare not determine. From my own observation, I am led to think that hardly in any case it should be introduced till five months are past; and even after that period, that it should be increased by degrees only to the time of weaning, so that at this last period no considerable change may be made.

Further, it relates to this subject to observe, that in some infants even the mother's milk is not properly digested; and particularly, that it becomes more acid than it should, and thereby produces disorder in the infant. How this is to be obviated or cured, it would be very desirable to say; but I do not find myself enabled to do it very clearly. It is not indeed always easy to perceive what is the cause of the disorder, whether it be the state of the nurse's milk, the state of other nourishment given at the same time, or the state of the child's stomach.

With respect to the first, it might be perhaps suspected that a too acescent diet given to the nurse might be to blame; but I have not perceived this; and I have observed the disease to happen as often to the sucklings of nurses who took a good deal of animal food, as to those of nurses who lived more entirely upon vegetable aliment: and I have known that when the disease was attempted to be cured by giving the nurse a larger proportion of animal food than usual, this has not answered the purpose.

With respect to the second cause, I am persuaded it is sometimes to blame; as I have observed that in several instances the disease happened to children who had been soon put upon the use

of vegetable aliment; which produced an acid different from that of milk, and more difficult to be obviated or corrected by the digestive powers of the infant.

With respect to the third cause, as I have observed the digestive powers of some infants capable of overcoming the faults both of milk and other aliment, so I have no doubt that in others the weakness of these powers is often the cause of the disorder we are treating of: but when even this is the case, I find it difficult to discern that the fault is in the digestive organs alone; and can only suppose it when other marks of debility in the whole system are to be perceived. One mark of weak organs of digestion may, I think, be coagulated milk passing with the child's stools.

From this uncertainty with respect to the causes, it must be difficult to say in general how the disease is to be cured; and it must be left to skilful practitioners to judge of the causes in particular cases, and to direct their practice accordingly.

Upon the subject of the chief use of human milk, it remains only to say what may be most proper to put nurses in the best condition to afford milk in the greatest plenty, and of the most proper quality. To this purpose I need not say, that if a nurse is chosen of a sound constitution, whatever in general is proper to preserve health is the chief, perhaps all, that is necessary to make her a good nurse. What are the measures in general proper for this purpose, it is not requisite to say; and the only particular that we are engaged to consider here is, that after having said so much of the connection between the diet employed and the milk produced, that we should determine as well as we can what is the most proper diet for nurses.

To ascertain this, we may observe, that the milks employed by the human species are all taken from animals living very entirely upon vegetable aliment; and therefore that a milk produced from that is sufficiently well suited to the human œconomy: but that it is the best suited to it may be doubted from hence, that the milk destined to new-born children is the milk of women, who are capable of employing, and do commonly employ, a mixed diet of animal and vegetable matter; from which it might be inferred, that a milk afforded by such a diet was the best suited to the human œconomy even in the infant state.

If, however, it be considered, that womens milk contains as much vegetable matter as any other, and that nature has appointed it to be employed at a time when the chief purpose seems to be the introducing a vegetable matter, the use of a diet allowable, and per-

haps necessary, at other times, does not afford an argument for its being proper upon this occasion.

I might say a great deal to show that the human œconomy, except in few instances, does not absolutely demand the use of animal food; that in fewer instances still does it demand it in large proportion; and that for the most part the health of the human body is best preserved by a large proportion of vegetable food. So from all this I think it will readily follow, that the health of women during the time of their nursing may be safely sustained by the use of vegetable aliments alone.

From the employment, therefore, of animal food by the human species, there arises no argument for the necessity or propriety of a woman's taking animal food during the time of her nursing. I allege it to be a matter of experience, that supposing the quantity of liquid to be the same, nurses living entirely, or for the greater part, upon vegetable aliment, afford a greater quantity of milk, and of more proper quality, than nurses living upon much animal food. This I venture to assert from the observations of fifty years; during which time, I have known innumerable instances of the healthiest children reared upon the milk of nurses living entirely upon vegetable aliments; and I have known many instances of children becoming diseased by their being fed by the milk of nurses who had changed their diet from entirely vegetable to the taking in a quantity of animal food. Nay, I have known instances of children becoming disordered from a nurse's making a single meal of an unusually large proportion of animal food.

If it be the purpose of nature, as it seems to be, to give infants milk of an acescent kind in pretty large quantity, Dr Young's experiments on bitches serve well to show how necessary a vegetable aliment is for that purpose; for these experiments inform us, that by feeding a bitch upon animal food alone, not only the quality of it was greatly changed, but the quantity of it also diminished.

To these arguments in favour of the employment of vegetable aliment by nurses, an objection might be made from what has been said above of the morbid acidity that sometimes occurs in the stomach of infants, and which may sometimes be imputed to an unusual acescency in the nurses milk, arising perhaps from the acescency of their diet. The possibility of such a case shall not be denied; but we are persuaded it is a very rare occurrence. Indeed such is the power of the animal œconomy to change the quality of acescents to an alkalescent state, that I believe the excess of acescent aliment, or even of acidity produced from them,

is never discerned beyond the primæ viæ, except in the supposed case of milk.

Even here, however, it cannot be certainly said that it ever goes beyond what the œconomy requires: for an acid was never found in recent milk; and in the case of nurses, it may be presumed that, as in other persons, the quantity of gastric and intestinal animal fluids, and the quantity of lymph that is always mixed with the chyle, is such as, joined with the action of the lungs, will always prevent any great excess of acescent matter prevailing even in the milk. It seems to me highly probable, that were it not by the power of secretion, the saccharine and acescent matter would not appear there. From these considerations, and from the fruitlessness of a change of diet towards correcting the suspected acescency of a nurse's milk which I have experienced, I am persuaded that the noxious acidity which often appears in the stomachs of children is never to be imputed to the acescent diet of the nurse, but to some of the other causes mentioned above.

Together with these considerations, I shall beg leave to suggest another in favour of the vegetable aliment of nurses; at least against their large use of animal food.

It appears to me, that in nurses, for a certain length of time, the determination of the blood to the uterus and ovaria is suspended; so that during that time neither menstruation nor conception takes place. We know, notwithstanding, that in some nurses both these states occur; and I am persuaded that they most readily take place in habits naturally plethoric, or rendered so by the large use of animal food. It is, however, generally and probably upon observation judged, that both menstruation and conception are always incompatible with the proper condition of a nurse; and therefore to avoid these inconveniences, it seems proper for nurses to avoid animal food altogether, or at least to take it very sparingly.

This suggests an observation that will be proper before we conclude this subject. In the earnestness I have just now expressed in recommending vegetable aliment to nurses, I had chiefly in view the state of hired nurses; who being frequently taken from the lower class of people, and who had been for the whole of their life before fed by vegetable food alone, so I had always observed bad consequences from their being put upon animal food. But I must observe here, that it is possible that hired nurses may have been before partly in the use of animal food, and that with respect

to such, there may be an exception to the taking away such food entirely.

The exception, however, that I intended especially to mark here, is with respect to women of condition who may choose to nurse their own children. Such women have pretty certainly been accustomed to animal food, and perhaps to a large proportion of it: and I should not think it by any means safe to take it away from them entirely; but it would be very necessary to diminish the quantity of it a good deal, and more or less according to former habits.

It now remains to consider the use of milk as an aliment for adults. It is seldom that the milk of women, or of asses and mares, is employed for the whole, or even for a great part, of diet; but when they can be employed in sufficient quantity, there is no doubt of their being sufficiently fit for the purpose, though certainly affording a weaker nourishment than an equal quantity of the milk of ruminant animals. It is the milk of the latter, and especially that of cows, that is employed in this country; and it is almost only with respect to this that I have had sufficient opportunities of making observation, so as to treat of it properly here.

As the different parts of which milk in general consists are all of a nutritious quality, and probably better suited to the purpose by their being introduced in a very liquid form; so cows milk commonly contains so much nutritious matter as to render it a very proper aliment: and we know that it is often sufficient for the whole of the nourishment of a man, and at least in many instances that it can serve for a very considerable part of it.

While it is thus in general suited to the nourishment of men, it seems to be equally fit for them at every period of life except for a few months of infancy; when, though cows milk has on certain occasions answered the purpose, yet from what has been said above, it does not seem in any case quite so fit as the milk of women.

At every other period of life except that last mentioned, there can be little doubt of cows milk being a sufficiently fit nourishment; but it may be more or less so at different periods. The younger children are, within the bounds mentioned, it seems to be the more fit; as at the same period, for the reasons given above, that vegetable aliment is necessary: but as it is doubtful if the human œconomy can be properly supported by vegetable aliment alone; so milk, as affording a portion of alkalescent matter, will be properly joined with it: and we know instances of a numerous people who

are sustained in a condition fit for all the functions of life by milk and vegetable aliment alone.

There can be no doubt, therefore, of the propriety of rearing children in the same manner. I believe it is hardly ever necessary to give children under the age of puberty any quantity of animal food; and we have innumerable instances in this country of children reared to the most perfect health and strength without the use of it, except the small quantity of it that is given by an egg, and this very sparingly and seldom bestowed. On the other hand, I have often observed that animal food much employed under the age of puberty has very hurtful effects, particularly in giving irritability and an inflammatory disposition to the system.

We are indeed of opinion that a certain portion of animal food is intended by nature, and is very well suited to the human constitution; and in cold climates, at the period of life when men are to be engaged in the laborious business of life, that animal food is then especially proper, and perhaps necessary, while at the same time that milk may be less sufficient for the purpose.

How long this state may continue I dare not determine; but whenever the powers and vigour of life begin to decline, as we are persuaded that the alkalescent state of the fluids is always increasing as life advances; so the more this happens, we are inclined to think that the more plentiful use of milk and vegetables may be again introduced.

It appears indeed clearly enough, that milk, in a certain proportion, is an aliment very well suited to every period of life, and might be constantly employed except in certain persons whose stomachs do not seem to digest it properly. From what cause this happens, it is difficult to determine. In every stomach milk is coagulated; but in certain stomachs it seems to be coagulated more firmly than in others, and in that state to resist the solvent powers of the gastric fluid: and we have had instances of this, in which milk taken into the stomach was after many hours rejected by vomiting in large curdled masses. What this depends upon I do not know, nor have indeed learned how it is to be remedied.

In other cases we have found that milk was more ready to become acid in certain stomachs than in others; and there is little doubt that in these also a coagulation takes place: but as we know that milk spontaneously coagulated, or coagulated by acids, is often taken down with perfect impunity; so it appears to me that the

coagulation which is here joined with acidity has little or no share in the disorders which follow.

These disorders from the acescency of milk are the same, though perhaps not so violent as from acescent vegetables; and the caution that some have expressed for avoiding the combination of milk with acescents in diet, is without foundation; for I have known innumerable instances of its being practised with perfect safety.

Milk is certainly hurtful by its acescency in no other case but where the stomach is preternaturally disposed to an acescent fermentation; when indeed it may be hurtful, and like other acescents aggravate the disease. It is, however, to be observed in favour of milk, that when the serous part of it becomes acid in the stomach, the oily and caseous parts are particularly fit for reabsorbing and uniting with the acid towards forming an animal fluid; and it is upon this account, if I mistake not, that for the most part milk is of easy digestion, and soon fills the lacteals with chyle. Of its fitness to unite with acids we have this proof, that milk, when coagulated by acids, has that acid always joined to the coagulated part; and in the first appearances of spontaneous coagulation, the acid which is formed nearly at the same time is always intimately united with the coagulated part. It is in proof of this that I have known many instances of heart-burn, from acidity prevailing in the stomach, immediately cured by a draught of fresh milk.

Having thus suggested what relates to milk as an aliment, it may be proper also to say a little of it as a medicine, as I shall not have another opportunity of doing so in this work.

It has been mentioned above, that though milk as taken in is not chyle, yet it is readily, and perhaps more readily than any other aliment, formed into a proper chyle; and therefore wherever the digestive organs are weak, milk may more certainly than any other matter supply nourishment to the body. Upon this account milk is a restorative medicine in all cases of emaciation and debility, at least in all cases where the digestive organs are not affected in a manner that renders them unfit for the digestion of it.

Not only, however, in a weakness of the solids, but also in every case of vitiated fluids, milk may be supposed to be a remedy. Indeed there can be no doubt of its affording a supply of animal fluid of the most perfect kind; that is, a fluid that has no tendency to increase the alkalescency or acescency of the mass of blood, and is rather fitted to correct both of these tendencies when they hap-

pen to prevail. At the same time, as by its liquidity it passes readily by the excretions, it can hardly give too full a state of the sanguiferous system; and while it carries nourishment enough to obviate too empty a state of the same, we may conclude it to be fitted to give the quantity of fluids the best adjusted to the system.

Whilst milk is thus fitted to give both in quality and quantity the most perfect state of the fluids, if we consider that all foreign matters introduced into, or vitiated fluids generated in, the body, are suited to make a part of the serosity, and thereby to pass off by the excretions, we shall readily find that milk employed for some length of time may not only be a means of correcting, but may also give occasion to the expelling, of every fault that has taken place in the fluids.

This doctrine may be held in general to be very true; but we must allow that there may be exceptions to it. If the fluids shall have been vitiated by a ferment added to them, as seems to be the case in the lues venerea, and frequently also, as we judge, in cancerous cases, we find that milk may often moderate the violence of the disease, but will by no means cure it, unless some means of correcting and expelling the ferment be at the same time employed. There may be other cases also in which there may be supposed an acrimony diffused in the fluids, which milk may not be found sufficient to correct, and therefore to cure the disease. In such cases, however, we suppose that the disease does not consist in the acrimony of the fluids alone, but in a faulty state of the general system, or in the functions of some particular parts, which gives occasion to the stagnation and corruption of the fluids; and such seems to be the case in many cutaneous affections which milk does not cure.

There is one disease in which a particular acrimony is supposed to prevail, and there are symptoms of it which support that supposition; but milk does not prove the cure of it. This is the scrophula, which often appears in children living almost entirely upon milk; and in many cases I have been persuaded that it was rather aggravated by the large use of milk in the diet of the persons affected. The disease indeed appears to me to depend upon a certain state of the lymphatic system which we do not understand; but we can say from experience that milk does not seem to have any power in correcting it.

From what has been said, it will be allowed that milk may be a remedy in many and various diseases; but it will be proper here to

take particular notice of certain diseases to which milk has been supposed to be particularly appropriated.

The first I shall mention is the phthisis pulmonalis: and how milk is adapted to many cases of this will not be difficult to find. However we may explain the origin of this disease, I would maintain that it never discovers its peculiar symptoms without discovering at the same time a phlogistic diathesis in the whole system. But as milk affords a less quantity of gluten, and a less alkalescent fluid, than any entirely animal food; so it must be of service in obviating a phlogistic diathesis, and may in time take off the tendency to it entirely. By this means it may moderate, and perhaps cure the disease. These effects may be obtained by milk of any kind; but it will be correspondent with our doctrine to remark, that it will be most effectually obtained by the milk of the non-ruminant animals; and of these by the milk of asses or mares more certainly than by that of women. Possibly there may be cases in which the purpose may be obtained by the use of whey more certainly than by milk of any kind.

It has been a common opinion, that the milk of women is better suited to the purpose than that of any other animal; but I doubt of this, as this milk has a larger proportion of oil in it than that of asses or mares; and considering how seldom it is that a quantity of womens milk sufficient for an adult can be obtained, the use of asses milk seems to be the more certain practice.

While I thus find the use of milk to be a remedy of phthisis pulmonalis, by its being fitted to obviate and remove a phlogistic diathesis, it may be asked why a nourishment more entirely vegetable might not be still fitter for the purpose? This doubt it is difficult to solve: but to do it as well as I can, I shall observe, that though possibly it may be true that a more entirely vegetable nourishment might be a more certain remedy, and that there are many examples of its success alleged; yet it may not be always the proper remedy, as there are cases of phthisis pulmonalis, which, though attended with phlogistic diathesis, are at the same time attended with a weakness of the digestive organs with respect to purely vegetable aliments.

It may be also observed, that though a phthisis may be very constantly attended with phlogistic diathesis, it is at the same time often attended with a state of great debility; and it may be dangerous to increase that too much, as a diet purely vegetable might do. But as I have not had an opportunity of determining these matters by any exact and decisive experiments, I must leave it to

the judgment of others to determine positively whether a milk diet be universally, or even very generally, the most proper remedy of a phthisis pulmonalis. I must quit the subject with this observation, that it will be difficult to determine universally with regard to this matter, as it is pretty certain that the cases of phthisis pulmonalis are more varied in their origin and circumstances than physicians have either perceived or explained.

Another disease to which it is alleged that milk is the proper remedy, is the gout. It will not be wondered that disputes have arisen upon this subject, when we consider what different opinions have been maintained with respect to the nature of the disease, and that every difference on this subject may give a different opinion with respect to the propriety of remedies. I shall not here venture to decide between these different opinions, nor enter into any of the disputes that have arisen upon the subject; but shall deliver the doctrine that appears to me the most probable, and submit it to the judgment of others.

It seems to me that the gout always begins in a plethoric habit, and that it is supported and made ready to recur by the same ; and consequently that if a man never used animal food, he would never have the gout : and that this is commonly the case is strongly confirmed by this, that there is hardly an instance of men who have been reared, and who have lived very entirely, upon a milk and vegetable diet, ever having the disease. To this consideration may be joined that of the many instances of men who by accident have been reduced to low living being cured of the gout, with which before they had been long afflicted. To apply this to our present subject, we shall observe, that as milk can never give a plethoric habit, so we believe that a diet consisting chiefly of milk will save a person from ever being attacked with the gout. As we know, however, that in the plethoric habits liable to this disease, a certain degree of vigour, and a certain firmness of tone in the whole system, particularly discovered by the state of that in the stomach, is necessary to produce the inflammation of the extremities, the necessary crisis in such habits ; so various disorders may be occasioned in such persons by diminishing the vigour and tone of the system. Accordingly it is possible that a milk diet, more especially as a change from one more nourishing, may have that effect ; and I am therefore of opinion, that for entirely preventing the gout, it is necessary that a milk diet be entered upon early in life, before the gouty diathesis be formed. But if, after the gout has come on, a milk diet is to be employed for a cure, it must be in persons of en-

tire vigour only; and there are instances of its being employed in such with advantage and safety. In gouty persons, however, advanced in life, and who are liable to a loss of tone, there may be much danger in attempting a milk diet; but at the same time I must say, that as milk is not so weak a diet as one entirely of vegetables, so the former will always be more safe than the latter.

It has been alleged by severals, that for preventing or curing the gout, a milk diet for life was not necessary, but that employing it strictly for one year was sufficient. It is possible that at a certain period of life it may be so, by taking off the disposition to a plethoric state, which after a certain period of life is not ready to return: but this is certainly precarious; for there are many instances of persons who had, for curing the gout, taken to a milk or vegetable diet for some time, and after being relieved by it, had returned to a fuller diet; which not only brought back the gout with more violence than before, but occasioned also various disorders in their bodies: and I am persuaded, that after an abstemious course for some time, it can hardly ever be safe to return to a free and full diet.

Several physicians have proposed milk as a remedy in all febrile diseases; and I have already remarked, that a diet of milk without any animal food joined with it, is often useful both in obviating and correcting a phlogistic diathesis prevailing in the system, and consequently any febrile state connected with it. But we must now observe, that when a pyrexia or fever is fully formed, the use of entire milk is an ambiguous remedy. In cases of continued fever, I have seldom found entire milk to be a grateful beverage; and it hardly quenches thirst. In most cases, I have observed it to prove disagreeable to the stomach, and often to excite the thirst it was intended to remove. This I have observed in formed fevers of all kinds, whether inflammatory or putrid. In fever, there seems to be in the state of the stomach somewhat unsuitable to the proper digestion of milk. Wherein this consists I cannot clearly explain; but from much experience I am certain of the fact. In spite, therefore, of the general and promiscuous commendations above mentioned, I never prescribe entire milk in any case of fever; and more especially as milk in its more liquid and acid states is more agreeable, and seems to answer better every purpose that can be proposed.

After thus considering the use of milk in general, as alimentary or medicinal, it may be proper to consider what choice is to be

made of the different milks that may be employed; and this may be determined very shortly.

Wherever the purpose is to introduce much nourishment, and where there is no hazard of favouring a plethoric state, the milk of the ruminating animals is always to be preferred, providing only that the digestive organs of the patient are quite sufficient for the digestion of it.

Upon the other hand, when the purpose is to obviate and diminish a plethoric state and phlogistic diathesis, it will be most proper to employ the milk of the non-ruminant animals, and especially when at the same time the organs of digestion may be suspected of weakness.

To conclude this subject, it remains for me to say in what manner entire milk may be most properly employed: And there can be no doubt that for every purpose it will be most proper in its most recent state; and certainly before it has proceeded to that separation of its parts to which it is disposed. Most physicians, and particularly Dr Boerhaave, have supposed that it cannot be exposed for any length of time to the air, without exhaling a volatile and highly valuable portion of it; but no body has been able to give any clear proof of any such exhalation taking place, or to show the nature of it. In the mean time, they have used this argument for supposing it, that it is on this account that, in the principal use of it, the nourishing of infants, nature has appointed it to be drawn from the breasts by sucking; thus providing that it should have no communication with the air till it was taken into the stomach of the young animal. This argument, however, like many others taken from our judgment of final causes, is fallacious. In the brute creation, we do not perceive that any of them are instructed, or could practise, any other means of drawing milk from the udders of the female, or of communicating it to their offspring, than this of sucking; and though the human species are capable of some artificial means to this purpose, I am well persuaded that it is impossible by any artifice to draw the whole of the milk from the breasts of a woman except by an infant's sucking; and that this is the reason for the institution of nature in this respect, without implying that milk suffers any hurtful change from its being for a short time exposed to the air.

To render it still more clear that milk cannot be hurt by the loss of any volatile parts, we are pretty well assured by this, that many nations are in the constant practice of giving a certain degree of boiling to their cows milk immediately after it is drawn from

the cow, and this without their finding that the qualities of the milk, for any purpose that it can be applied to, are in any manner injured. On the contrary, they find, that by boiling the milk is less disposed to acescency, probably in consequence of its being by boiling deprived of a considerable quantity of air that might have been favourable to that fermentation.

Another part of our subject yet remains, which is, to ascertain the alimentary or medicinal qualities of the several parts of milk when employed in their separate state; but what we have to observe with regard to this shall be mentioned very shortly.

Butter, or the oily part of milk, has precisely the same qualities as are to be found in the other expressed, or, as they are called, Fat Oils, whether taken from animals or vegetables; and the use of all of them, as employed either in diet or medicine, we shall have occasion to consider in another place. The only question that might particularly occur here is, Whether the oily part of milk is most safely employed in the state of cream, when it is joined with some portion of the caseous and serous parts, or when it is more entirely separated from these in the state of butter. I cannot be positive in answering this question; but it appears to me, that a quantity of oil in the state of cream will be more easily digested than an equal quantity of the oily part in the state of butter. Some difference, however, in this matter may arise from the difference of stomachs more or less disposed to digest oils; and I have known persons who could digest cream better than they could butter. Another difference in this respect may also arise from the stomach being more or less disposed to acidity; and in the more acescent stomach, cream may be more offensive than butter.

The caseous or coagulable part of milk is certainly a great, if not the greatest, part of the nourishment which milk affords; and therefore taken by itself must be considered as a very nourishing matter. Even when taken as produced by spontaneous coagulation, though then very much separated from the oily part, it may be considered as nutritive. But when an artificial coagulation has been practised upon new milk, and when therefore the oily part is joined with the the caseous, it must be considered as containing nearly the whole of the nutritious matter of the milk it is taken from; and if the coagulum is taken without the whey being separated from it, it certainly contains the whole, and will be as easily digested as fluid milk taken in. It is therefore a matter of indifference, both with respect

to digestion and nourishment, whether milk be taken in its fluid or in its recently coagulated state.

When the coagulum has the whey separated from it, it then becomes a more nutritious substance than the milk it was taken from, but will probably be of more difficult digestion than either that or the entire coagulum just now spoken of. Whilst, however, the coagulum, from which the whey has been in a great part separated, remains still in a humid state, that is, with a portion of the whey still adhering to it, it will be of more easy digestion than when that humidity is more fully taken away, and the whole mass pressed more closely together is brought into the form of cheese.

Cheese in its dried state is, as we have said above, in very various condition; but its qualities in these different conditions may be readily perceived. When it is made from milk previously deprived of its cream, it may be still a very nutritious matter, but of very difficult digestion, and fit only for the most robust persons; and even the difficulty of digestion may diminish the nourishment which it might otherwise have afforded.

Cheese made of entire milk must be a still more nourishing substance, and I believe of much easier digestion; and cheese made of entire milk, with a portion of cream taken from other milk added to it, will be still more nourishing, and hardly of less easy digestion, as the oily parts every where interposed between the parts of the gluten must render the adhesion of this less firm. As cheese is often made of cream alone, the qualities of this will be readily understood from what has been just now said.

We have likewise mentioned above, that cheese is not always made of cows milk only, but also of the milk of ewes or goats, and often of a portion of the two latter added to cows milk. In all these cases, as the milk of ewes and goats contains a larger proportion both of the oily and caseous parts, so in proportion as these are employed, the cheese becomes more nutritious, but at the same time of more difficult digestion.

As cheese is employed not only when recent and fresh, but also under various degrees of a certain corruption it is liable to, so by this it acquires new qualities; and according to the degree of corruption, it becomes more acrid and stimulant, partly from the acrimony it has acquired by corruption, and partly by the great number of insects that are very constantly generated in it in that state. In this corrupted condition, cheese can hardly be taken in such quantity as to be considered as alimentary; and in what measure or manner it may be, as is commonly supposed, considered as a

condiment influencing the digestion of other food in the stomach, I cannot clearly explain.

With respect to cheese, there is yet one particular to be mentioned, and which is to remark, that it is often eat after having been toasted, that is, heated over the fire to a considerable degree; whereby a portion of its oil is separated, whilst the other parts are united more closely together. I know many persons who seem to digest this food pretty well; but it is certainly not easily digested by weak stomachs: and for those who can be hurt by indigestion, or heated by a heavy supper, it is a very improper diet.

Many people, especially the poor in mountainous and pasture countries, use milk very much in a coagulated state. There is a particular manner of employing it; which, for ought I know, is peculiar to Scotland, and, as I judge, deserves to be taken notice of.

The preparation of it is as follows. A portion of skimmed milk is put into a wooden vessel, deeper than wide, and which has a hole in its bottom stopped up with a peg, which upon being taken out will allow a liquor to be drawn out of the vessel. This vessel is to be set in another that is wider and deeper, and in which, therefore, the smaller vessel may be surrounded with boiling water. When this is done, the vessels are allowed to remain for one or two days, more or less according to the state of the weather; after which time the milk is found coagulated, and the watery part separated from the coagulum has subsided to the bottom of the vessel. This acid water is then drawn off by the aperture above mentioned; and the small vessel being again stopped up, it is again set in the larger vessel, to be surrounded with boiling water as before. After matters have remained in this state for twenty-four hours longer, it is found that more of an acid water has been separated from the coagulum; and this water being drawn off as before, the coagulum, now of a pretty thick consistence, is stirred and agitated pretty briskly by a wooden stick; and in this condition it is presented upon our tables.

This dish, during the whole of the summer, in Scotland, is often used by the middling rank of people, and is well known at Edinburgh under the name of Corstorphin Cream, and as denominated from the neighbouring village, in which it is especially prepared; it is brought to market in all the considerable towns of Scotland. It is an aliment tolerably nourishing; and by the quantity of acid still retained in it is moderately, but gratefully, acid and cooling. I have frequently prescribed it to phthisical patients; and neither in

these, nor in any other persons, have I ever known any disorders of the stomach or intestines arising from the free use of it.

After having thus considered every thing relating to the caseous part of milk, there remains to be considered what we marked above as a third part in the composition of all milk, and which is its watery part.

This we shall consider first as in the state of *butter-milk* produced in the manner above described. This is commonly procured from milk after it has been kept for some time, and has become more or less acid: but it may be procured from very recent milk; and in this case the butter-milk is not acid, and only differs from entire milk by the oily part being taken away. In this state it is still tolerably nourishing; and being often more easily digested than entire milk, I have often employed it in phthisical cases with more advantage than I could do either the entire milk or the watery parts of it in a more acid state. It is in this last state, however, that it is most commonly employed; and it is highly useful in all cases where the refrigerant powers of milk are required. As the longer it has been kept it seems to have its acidity increased, so it proves more powerfully refrigerant. Some have imagined that in certain cases it might be dangerous: but unless when drank in very large quantity, or when the body is very warm, I have not perceived its bad effects; and in the last case, it is probable that cold water would have done the same mischief. With respect to the acid of butter-milk, or other acid states of the watery part of milk, it is worth observing, that such acid does not increase the acescency of the stomach, or occasion the flatulency that recent vegetable acids and acescents commonly do; and therefore it is more safely than these employed in dyspeptic persons.

The state in which the watery part of milk is chiefly employed is that of *whey*, strictly so called. As this is separated from entire milk, and from a coagulum produced by runnet; so, besides a saccharine matter, it always contains a portion of the oily and caseous parts, and in consequence is a nutritious fluid. It is, however, still less so than entire milk; and therefore when a plethoric or phlogistic state of the fluids is to be obviated or corrected, it seems to be fitter for the purpose than any entire milk, though it may be doubtful if the whey of the milk of ruminant animals may not be as nutritious as the entire milk of the non-ruminants.

Whey, however, is chiefly to be considered on account of its peculiar ingredient of sugar; which by its being afforded by this and so many other alimentary substances, must be considered as of the

most salutary nature with respect to the human œconomy. It is by this, or by the acid which it is changed into, that it must be considered as peculiarly suited to obviate the phlogistic and too alkalescent state of the human fluids; and as whey can be commonly taken in greater quantity than any entire milk, it may in many cases of disease be a more effectual remedy. It is only upon this supposition of its being introduced in larger proportion, that I can understand the so-much-commended virtues of the *sugar of milk*; for when this is purified to a certain degree, I cannot perceive that it differs from the sugar obtained from the sugar-cane or other substances; and when employed in its impure state, I cannot conceive that much virtue can be supposed to be given to it by the small portion of the other parts of milk which may be adhering to it.

Hitherto we have considered whey as taken in before it has undergone any acescent fermentation: but it is frequently taken in its acid state as a part of, or along with, alimentary substances; and in this state must be viewed as less nutritious, and chiefly as an acid only useful for the purposes above mentioned. It is now, however, to be observed with respect to the qualities of whey, that from its disposition to acescency in certain stomachs it may suffer this change to a noxious degree, and show the flatulency and other circumstances attending the cases of morbid acescency. It is by the same saccharine quality that it proves a laxative; but whether this depends upon its retaining its entire saccharine state, and in that state stimulating the intestines, or that it depends upon the acid produced from it mixed with the bile, we shall have occasion to consider in another place.

Article II. *Of Animal Food strictly so called; that is, Food consisting of the whole, or of part, of the Substance of Animals.*

The solid and fluid parts of the mammalia are so nearly of the same nature with one another, that the fitness of all of them for nourishing any of the other who live on animal food, and therefore the fitness more or less of all of them for nourishing the human species, can hardly be doubted of, and is very well established by much experience. In considering, therefore, the mammalia as affording aliment to man, we have only to examine the greater or less fitness of the several orders, genera, and species, for that purpose. This we shall do, in the first place, by considering those qualities of animal food, by which it is more or less fitted to be an aliment to man; and afterwards, we shall inquire how far these

qualities are to be found in the particular species of animals commonly employed for this purpose.

That quality of animal substances fitting them to be aliments which first deserves to be mentioned, seems to me to be the degree of solubility in the human stomach. The solution of food in the human stomach may be assisted by manducation, but certainly depends for the most part upon the power of what is commonly called the gastric juice, which nature has provided as a solvent to a certain degree of the several solid or consistent matters taken down into the stomach.

This solvent, however, as we have observed above, is of greater or less power in different animals; and so it seems to be in the different individuals of the human kind. How far this may depend upon different states of the gastric fluid in different men, we have not yet been able to discern; but in all of them it seems to be manifestly different according to certain conditions in the aliments taken in, and particularly from these giving it a different degree of solubility; and which are therefore to be especially investigated.

The condition especially giving more or less of solubility, is the different firmness of texture which appears in animal substances: and this again is different in the different species of animals, according as these are either very entirely carnivorous or phytivorous; the substance of the former being more dense than that of the latter. This, joined with some other considerations, explains why the former are hardly ever, and the latter so generally, employed as aliments to man. It may be supposed that this difference in the density of the substance depends upon the nature of the aliment which these different sets of animals employ; and therefore that even those who employ a food partly animal and partly vegetable, should be of a more dense substance than those who live entirely upon vegetables. This, however, does not appear to be strictly the case; for the substance of the bull is more dense than that of the dog.

2*dly*, In the phytivorous animals the density of the substance is different in the different genera and species by an institution of nature, of which the cause cannot be assigned; but the fact is very evident, as the density of beef is, *cæteris paribus*, always greater than that of mutton.

3*dly*, In the same species the density is different according to the sex; the substance of the male being always more dense than that of the female. In the male sex, however, castration at an

early period of life makes a considerable change, as it prevents the animal from acquiring the same density of substance which it would have acquired had the genitals remained entire. Castration has also the effect of disposing the animal to grow fat, which, as we shall say presently, has an effect in rendering meat more soluble.

4thly, In the same species, the density of its substance is different according to the age of the animal; and as the density of every animal is always increasing as the animal advances in life, so young meat is universally more soluble than old: and this goes so far, that in many species we employ only the young and hardly ever the older animals in diet. There is, however, a difficulty which occurs here. Although from their texture young meats are more soluble than old, and appear to be so in decoctions with water, yet in some stomachs the young meats are more slowly digested than the old; and thus in some persons veal is more slowly digested than beef, and lamb than mutton. Indeed Dr Brian Robinson has given us this singular fact, that in one person he found chicken to be more slowly dissolved than any other animal food. What this is owing to, is difficult to determine. Whether in certain stomachs very much disposed to acescency, the solution of animal meats may not be delayed by that acescency, and that in such stomachs the most alkalescent foods will be most easily digested? And as we shall say in the sequel that the older meats are more alkalescent than the younger, this may perhaps account for the difference mentioned, that sometimes occurs in the digestion of them. We are disposed to think that it does so, because it is observed that the difficult digestion of young meats happens especially in the most acescent stomachs.

Another cause for the difference of digestion mentioned may in some cases be the more gelatinous nature of young meats than of old: and this seems to have a share; for I find the jellies of all animal substances, though extracted from old animals, to putrify more slowly, and with more previous acescency, than the recent juices of animals. It may not be improper to observe also here, that in acescent stomachs, liquid aliments, though extracted from animal substances, are more difficultly digested than solid meats. Does not this happen from the liquidity favouring acescency?

5thly, In animals of the same species, sex, and age, the flesh of individuals is of greater or less density as they are fatter or leaner. In lean animals, the fibres of which their flesh is composed are more closely compacted together, while in fatter animals these

fibres are more separated by a cellular texture filled with oil; and the flesh of the latter, therefore, is not only rendered more soluble by the laxity of its texture, but also as we judge by the quantity of oil which enters into the substance of the fibres.

Sometimes, however, it happens, that fat meats are of more difficult digestion than those that are leaner: but this arises from the fat in those meats being collected in masses separate from the fleshy fibres; and in such cases the difficulty of digestion arises from the difficulty of digesting a large proportion of oil; with respect to which indeed, as we shall say hereafter, the power of different stomachs is very different.

6*thly*, In the same animal the solubility is different in the different parts of it. Of the fleshy parts, connected by a looser cellular texture, the solution readily takes place; whereas of the membraneous parts in the tendons and ligaments, in which that texture is more closely compacted, the solution is more difficult.

7*thly*, In meats in other respects of the same qualities, their solubility is greater according as they happen to be further advanced towards putrefaction. It is well known that putrefaction to a certain degree destroys the cohesion of all animal substances; and the tendency to this, if it be not prevented by the want of air, by cold, or antiseptics, applied, begins as soon as the animal dies. It is for this reason that meats recently killed are not so soluble as those that have been kept for some time. There is, however, a period in the progress of putrefaction at which meats become unfit for the human œconomy: but it is difficult to determine the limits of this; for there are certain stomachs to which meats, when any approach to putrefaction is discoverable in them either by their taste or smell, are highly offensive; while there are many stomachs in which meats highly tainted are readily digested, and perhaps more readily than fresher meat.

8*thly*, Not only are animal substances more soluble as they are more advanced towards putrefaction; but they seem also to be so according as they are more disposed to suffer that change, or, as I would otherwise express it, as they are more alkalescent.

It is very probable that this is not only different in different animals, but also in individuals at different times; although we find it difficult to distinguish the different degrees of it, or to assign the causes of these. In many cases it seems to depend upon an institution of nature, giving more of this quality to one genus or species of animals than to another, without our being able clearly to explain the causes of this: but the natural constitution of the

animal being given, we can often mark the circumstances which increase or diminish this quality and disposition in individuals; and it will certainly be of use to ascertain these as well as we can. The state of it seems to be according to the age of the animal, according to the diet it lives upon, and particularly according to its habit of more or less exercise.

As an alkalescency is the peculiar disposition of the animal œconomy, so it is probable that this increases as life advances: and as we have given above some reasons for believing young meats to be less alkalescent than old, so there are several marks of the fluids becoming more acrid as life advances; and therefore that the alkalescency of animal substances may be in general according to the age of the animal.

With respect to diet, there can be little doubt that the alkalescency of the animal fluids will be greater or less according to the difference of food on which the animal lives; and accordingly that it is manifestly greater in the entirely carnivorous, than it is in the entirely phytivorous, animals: and this, as I have said before, we take to be the reason or instinct determining the former to be so rarely, and the latter so commonly, the food of mankind. With respect to these animals that live sometimes on a vegetable and sometimes on an animal diet, we have a clear illustration in the experiments of Dr Young on bitches, serving to show the influence of animal food in giving alkalescency to the animal fluids.

Of the quadruped kind there are none employed in the diet of this country which gives us an opportunity of marking the effects of such a difference of diet; but probably some difference might arise from their living upon grain, or more entirely upon grass: and in the bird-kind there is probably a considerable difference arising from the bird's living more upon animal food or more upon vegetables; as we shall more particularly take notice of in the sequel.

Lastly, The alkalescency of animal food seems to depend upon the animal's being more or less in the habits of exercise. As it is sufficiently probable that the alkalescency of the animal fluids is in some measure produced, and always increased, by the activity of the circulation: and as this therefore is greatly increased by exercise, so it is probable that animals, the more they are in the habits of exercise, will have their fluids in a more alkalescent state: and this is confirmed by every other means we have of judging of this matter; as we shall say more particularly hereafter.

To conclude this subject, it may be supposed, that the alkales-

cency of the different animal substances might be determined by the different proportion of volatile alkali, which might be obtained from them by distillation: but to this purpose few or no experiments have been made on the different alimentary substances; and although it is probable that some difference might be found, yet from several trials made by us, the difference is so inconsiderable that it will be difficult to ascertain it with much precision, and therefore to apply it to the present subject.

Besides considering animal aliments by the difference of their solubility as we have done, they may also be considered by their being more or less perspirable. SANCTORIUS's account of mutton, and KEILL's account of oysters, might lead to an opinion, that the difference in this respect is considerable; but DE GORTER found neither the one nor the other fact confirmed by his experiments. It is, however, still highly probable that aliments, and even animal aliments, are different in this respect; and the matter deserves to be examined by experiment. I am indeed very much surprised that more observations on this subject had not occurred to SANCTORIUS, and other persons who have been engaged in experiments upon perspiration: but I must own, from the experiments I have myself made, that the difference is commonly so inconsiderable, and so many other circumstances may at the same time concur to vary the state of perspiration, that it will be always difficult to determine what depends upon the aliment alone.

In the mean time, I would reason in this manner: As they are the alkalescent parts of the animal fluids that form the excretions, we are persuaded that, *cæteris paribus*, the different animal aliments will be perspirable in proportion to their alkalescency, as determined above: and so far as experiments in this way can be trusted, our opinion is confirmed by experiment; and particularly that the old, or as I may call them the more saline, meats, are more readily perspired than the young and gelatinous.

The last consideration I have to offer with respect to the aliments taken from quadrupeds is, that they differ according to the quantity of nourishment they severally contain; which, however, we find to be a matter difficult to determine. It might be supposed that it would be according to the quantity of soluble matter, and therefore of the extracts obtained by the solutions which we practise out of the body: but this we cannot readily admit of, when we consider and believe that the gastric juice can dissolve the whole of the substance of the several aliments more entirely, certainly more quickly, than can be done by any application of boiling

water; and therefore we are of opinion that the quantity of nourishment in the several aliments we are considering, is to be estimated by the quantity of animal matter in each of the several kinds that is soluble by the gastric juice, and will therefore be according to their respective densities.

We have supposed that the aliments will be more or less quickly dissolved by the gastric juice according to the degrees of solubility in each, as determined by the circumstances above mentioned: but whether there are any limits set to the powers of the gastric juice, with respect to its more or less complete solution of all the parts of the substance which it anywise dissolves, we cannot positively determine. The gastric juice of the human stomach does not dissolve the bones or cartilages of animals; and perhaps it dissolves the more firm and membranous parts less completely than it does the fleshy: and it seems to be the latter only which it dissolves very entirely. Whether it makes any decomposition even of these, as decoction in water does, and therefore leaves some portion of their earthy parts undissolved, I would not positively determine; but such a decomposition seems to me very improbable; and therefore would conclude, as above, that the quantity of nourishment in any meat which the gastric juice entirely dissolves, is in proportion to the quantity of animal matter which it contains. Upon this ground I would conclude, that in equal weights of beef and veal, notwithstanding what appears in their decoctions, there is more nourishment in the former than in the latter; and our experience in the feeding of animals who take in such food is certainly in confirmation of this. What difference may arise from the more alkalescent and perspirable state of the one, and from the more gelatinous and less perspirable state of the other, I leave to further consideration.

To conclude the general consideration of aliments taken from quadrupeds, I must say a little of their effects in general on the human constitution.

The first effect to be taken notice of is their giving, in the same proportion taken in, more nourishment than any vegetable aliments do. The latter can afford, as we have said, the whole juices of an animal body, but certainly not in proportion to the quantity of them taken in; whilst animal substances that can be entirely dissolved in the gastric juice seem in proportion to that quantity to be entirely convertible, as the expression is, *in succum et sanguinem*. If at the same time they are in the smallest quantity less perspired, they must greatly increase the plethoric state of the blood-vessels.

Animal food, therefore, is always ready to induce this state ; and in growing bodies, such food will always favour, and probably hasten, the growth : and although in adults, exercise and other means, by supporting the excretions, may prevent its having this effect, yet it will always have a tendency to produce a plethora ad volumen. Moreover, as animal aliments for the most part introduce a greater proportion of oily matter, they are ready to occasion a larger secretion of oil into the adipose membrane, and thereby produce obesity ; which when considerable must straiten the sanguiferous vessels, and consequently produce a plethora ad spatium.

Animal food having thus a considerable tendency to fill the blood-vessels, so it must support the constant tension of these, and thereby, in my opinion, give a greater degree of strength to the whole body ; and from the doctrines laid down above on the subject of irritability, it will also readily appear, that animal food is likely to increase the irritability of the system.

It deserves to be particularly attended to, that as the balance between the several parts of the system may not always be exact, so the plethoric state may be greater in one part than in another; and thus if it happens to give a greater tension to the vessels of the brain, it may dispose to epilepsy ; or if it happens to give an increased tension to the vessels of the lungs, it may dispose to asthma. More particularly, if it be considered, that in all full systems, the lungs must always be most exquisitely filled ; and that nature has provided that the vessels of the brain should always have a due degree of tension : so it will be readily understood why these two parts of the system must always be readily affected by every unusual fulness of the sanguiferous system, and from the general irritability at the same time induced, may give occasion to many particular diseases.

It is also to be observed, that when animal food gives a general fulness of the blood-vessels, if the balance between the arteries and veins be not exactly adjusted, an undue proportion may take place ; and if more than usual is retained in the arteries, it may give occasion to arterial hemorrhagy ; or, if a greater quantity of blood than usual is thrown upon the veins, it may produce an overcharge either in the system of the vena portarum, or in the venous system of the head ; and what consequences may arise from either of these circumstances, I need not explain.

Some of our readers may perhaps judge, that a great part of what I have now said might have been left to be understood from the general doctrine of Plethora ; but both because I think that

general doctrine has not been always well understood, and because when it was my business to explain the effects of animal food, I thought it necessary to show, that its effects are especially to give a nicer balance in several respects to the system, and thereby give a disposition to many diseases which might be avoided by a more temperate use of such food. It deserves also to be remarked, that though a proper measure of such aliment, with an exercise suitable to it, may render it long consistent with health, yet as the constant use of it gives a nicer balance to the several parts of the system, so every unusually large indulgence in it must be extremely dangerous.

This leads me to take notice of what perhaps I should have begun with; that is to mention the effects of animal food, as it is immediately taken into the stomach: but I still think it will be more proper after what I have said.

We are of opinion, that every kind of food taken into the stomach, as soon as it sets this organ to work, increases the action of the heart, and occasions a frequency of pulse; and if we mistake not, by the energy of the brain's being thus directed to the heart and stomach, a torpor in the animal functions, both of sense and motion, is induced, and often to a degree of sleepiness. These are the effects of food soon after it is taken into the stomach; and it seems also manifest, that these effects are more considerable from animal than from vegetable food. It seems also equally manifest, that the feverish state during digestion is in proportion to the alkalescency of the animal food taken in, and that the degree of torpor induced, and the continuance of the feverish state, is more or less according to the quantity of food taken in, and according to its being more or less readily soluble by the gastric juice.

From these considerations, the whole phenomena of digestion, with respect to the system, may be explained: and, upon the whole, that although animal food may be admissible by the human œconomy; and in certain circumstances of that it may be proper and even necessary; and therefore that, in many cases, it may be consistent with health: yet that, for the most part, a small portion of it only is necessary; that the very temperate and sparing use of it is the surest means of preserving health and obtaining long life; whilst the large use of it tends to the production of diseases, and to the aggravation of those that from other causes may incidentally come on.

We are much disposed to remark, that the opinion of an ancient writer, though not Hippocrates, was well founded. He asserts,

that the best means for preserving health is *nunquam satiari cibis et impigrum esse ad labores*; and we believe that this was meant especially with respect to animal food. We must also observe, that an otherwise wise ancient, has in our opinion given a rule of the most pernicious kind. When Celsus says, with regard to eating, *Modo minus, modo plus justo assumere*, the rule may be allowed; but when he says, *Et semper plus dummodo hunc concoquat*, he gives a very fallacious test of what is safe, and, in general, a very dangerous rule.

Before I leave the subject of animal food in general, I must touch a question that I think especially relates to it; and that is, whether sleeping after a full meal be suitable to the health of the human œconomy? If we are to trust to the institution of nature in the brute creation, and suppose that their instincts are generally suited to the health of their œconomy, it would appear that sleep after eating is suited to favour their digestion; but whether the same may be suited to the human œconomy may be doubtful. The propensity to sleep after eating is commonly the same in man as in brutes; and I am persuaded that, in elderly persons, after a midday meal, it may, in some degree, be indulged; but I am equally persuaded, from my observation and experience, that a full supper immediately before going to bed is generally hurtful. Whether this happens in those persons especially who take two meals of animal food every day, or that a long sleep after such a meal, during which, not only the animal, but also the natural and vital functions should have a great deal of rest, is the cause of the bad consequences which often follow, we cannot positively determine.

The solution of this and many such questions is much embarrassed by this, that errors in the conduct of what relates to health, when moderate in their degree, do not immediately show their effects; and only after a long time, in consequence of frequent repetition, when from our gross ignorance of the animal œconomy we do not perceive and readily mistake the cause of the disease then arising.

Having thus considered the qualities of the aliments taken from quadrupeds in general, we must next endeavour to say what of those qualities prevail, and how they are diversified in the several genera and species.

The first in our list is the Bos or *Ox* kind. The flesh of this is the most dense of all the quadrupeds; and how far that density goes in preventing solubility, we have an instance in the bull,

whose flesh is seldom chosen as a part of our diet. The flesh of the female sex is of a much more soluble nature, and sufficiently fit for nourishment; but we commonly prefer the castrated ox, in which the fat is better mixed, and as more alkalescent the flesh is more sapid; and, unless it be from a very old animal, is generally to be preferred.

The chief difference of aliment in the ox kind, is that which appears between the old and young; the flesh of which last is named VEAL. This, as less dense, appears in our decoctions to be more soluble; and, in consequence of this, gives more of a gelatinous extract than the flesh of the adult: but it is not, therefore, more nutritious, as the gastric juice dissolves more than the water in our decoctions.

In young animals, the softer texture depends upon there being little difference between the muscular fibres and the cellular texture interposed between them. But this state is limited to a certain period of their growth. In veal it is when they are under two months old; for after that, and sometimes before it, the muscular fibre becomes more distinguishable, and the whole substance becomes less tender. Why veal gives a more gelatinous decoction than the older animal, we shall endeavour to explain hereafter.

OVIS, or the *Sheep* kind. These afford a dense substance, but less so than that of the ox kind. The difference of sex has the same effects here as in the ox kind; and more clearly here the flesh of the castrated animal is universally preferred. In this species, a circumstance to be taken notice of more than in any other, is, that the meat of this animal is more sapid, and seemingly more easily digested at a certain advanced period of its life, than when it is younger. Mutton under two years old, is less sapid and more difficultly digested than when it is several years older; and it seems to be in its greatest perfection at the age of five. This we ascribe in part to its alkalescency, greater at that period than when it is younger; but especially to the proportion in which the cellular texture filled with oil is to the solid fibres between which it is interposed. How far these circumstances take place, as some suppose at a period of life still more advanced, we cannot determine; but are persuaded it must have its limits, as the density of the solid increasing as life advances, may, at a certain period, very much diminish its solubility.

With regard to the Sheep kind, I hold that the same difference takes place between the young and old; that is, between LAMB

and a full grown Sheep, as in the Cow kind between veal and beef.

With respect to Lamb, there is a particular management that may take place. If the lamb is allowed to suck its mother for six months or a little more, it becomes an aliment more nourishing and digestible than that of a lamb of the same age that had been weaned as usual at two months old.

Capra, or the *Goat* kind, is more dense and insoluble than that of the sheep, partly from its nature and partly from its food and exercise; so that even the flesh of the castrated kind is seldom admitted where any delicacy of aliment is studied.

Sus, the *Sow* kind. The peculiarity of the aliment taken from this genus consists in the quantity of oily matter which is here accumulated in the adipose membrane separately from the muscular parts, and that in greater proportion than in any other of the quadrupeds we employ in diet.

We have said above, that the oil of animals enters for a great part into the composition of the animal fluid, and is therefore a directly nutritious matter, and is further necessary for many purposes of the animal œconomy, to be laid up in the adipose membranes of the human species. We hold it, therefore, for certain, that the flesh of quadrupeds is a more nutritious, and a more proper aliment, as it contains a greater portion of oily matter, providing only that this is no more than the digestive organs can properly assimilate. In this respect we find the digestive powers, as observed above, to be very different in different persons. In some, the power of assimilating oily matter is very great, while in others it is extremely limited; and frequently in the same persons it is different at different times.

Whether from want of habit, from accidentally excited aversion, or from peculiarity of constitution, it is, that many persons of Scotland do not admit of pork or bacon in their diet, or digest it easily, I do not know; but certainly they are in greater number than in our neighbouring country of England. In those who do admit of it, it proves an easily digested and very nourishing food.

In this species there is the same difference as in others between the flesh of the young and of the adult animal: and here the difference turns upon the pig or young animal being always less fat than that of the adult; and is therefore more digestible to many persons who cannot digest the flesh of the adult. As in other species also, there is some difference from the sex; and the same dif-

ference in the castrated male and one that is entire: but it appears that these differences are less considerable than in any of the other species of quadrupeds. It is to be remarked also, that this species affords a food prepared in a manner that cannot be applied to any other; this is what is called Brawn; a substance not readily soluble, but in such stomachs as can dissolve it, affording a great deal of nourishment. What is properly the Brawn, seems to consist chiefly of the adipose membrane closely compressed; so that much of the oil is squeezed out, while the cellular texture remains so closely united as to form a transparent substance.

Cervus, the *Venison* kind; for to this genus the term Venison is most properly and strictly applied. There are three species employed in the food of this country; viz. the Stag, the Fallow Deer, and the Roe. They are all wild animals and much exercised: they are, therefore, alkalescent; and though of a dense substance, yet at a proper period of their age, and being of tolerable fatness, they are sufficiently soluble and nourishing.

The Stag kind, as much exercised, are of the most dense substance, and perhaps most alkalescent; and therefore most sapid to many persons: but as the fallow-deer are most commonly better fattened, they afford a more soluble meat.

The Roebuck in its flesh seems to be of the tenderest substance; but as more rarely of much fatness, is perhaps less readily soluble.

[*I have nothing very particular to observe concerning the venison of North-America, which, as it is sometimes procured from the same species of cervus that are found in the old continent, may be supposed to be nearly the same. But there are two kinds of venison that are peculiar to North-America, viz. the cervus Wapiti, or round-horned elk, and the cervus Americanus, or common deer. The meat of the former is much more nearly allied to beef than that of the latter, which is the venison usually consumed in the large towns of the United-States. This is a very soluble food, and, unless when taken in very large quantity, is less apt to prove oppressive to the stomach than almost any other meat of the pecora with which I am acquainted. There is a very striking difference, much in favour of the former, between the wild and domesticated venison of this species.*]

Lepus, the Hare. As this animal is wild and much exercised, its flesh is dense and not easily soluble; but from its nature and exercise it is an alkalescent food, and is therefore more easily digested, and proves tolerably nourishing. As it is an object of

chace, and often only killed after long exercise, it is therefore often much deprived of the oil that should be in its cellular texture; and is then more difficultly digested than when it is suddenly killed.

Cuniculus, the Rabbit; a species of the same genus with the hare, but by nature, and from its being little exercised, it is of a very different quality; still however of such a dense substance that we hardly ever employ the adult or older animal. The young are of a tender and white substance, and afford an aliment very readily digestible, and considerably nourishing.

[*I have nothing particular to observe concerning those species of lepus, or cuniculus, that are peculiar to America. The most common of these is the lepus Americanus, or, as I call it, lepus Whapus, the flesh of which is much consumed in the United-States. The meat of this, though by no means white, is sapid, and I think considerably nutritious.*]

The mention of the white flesh of the rabbit leads me to take notice of what perhaps I should have spoken before; the difference between the white and red meats, which was long ago marked by Dr Cheyne. This difference certainly depends upon the greater number of red arteries, and therefore upon the larger quantity of red globules interposed between the muscular fibres in the one case than in the other. As it is probable that the red globules of the blood are considerably alkalescent, it will follow, that the red flesh is more alkalescent than the white, agreeable to what we have said above, that the substance of young animals, in which the white fleshes are especially found, is less alkalescent than that of the old. It is properly, therefore, that the white meats are considered as less irritating than those of a red colour; abstracting, however, from the effects in the stomach that may happen from their gelatinous nature spoken of above.

What consideration from the quantity of red globules present in a portion of meat may arise with respect to the nourishment it may afford, is not easily determined, but we are persuaded it may be a reason for supposing it to be greater in red meats than in white; and therefore a further reason for its being greater in old meats than in young.

I have now spoken of the quadrupeds employed as aliments in this country; and of those of other countries I have omitted to speak, both because I have not experience enough to enable me to speak of their particular qualities, and because I expect the principles I have laid down with respect to those I have treated

of, may be applied to the state of other animals, by any persons who are acquainted more exactly with their nature and circumstances.

There are certain general questions relative to the aliments taken from quadrupeds, particularly with respect to their preparation; but as the same questions relate to the other hot-blooded animals that we are yet to treat of, I shall delay the consideration of these questions till I shall have considered the other set of hot-blooded animals, the Birds.

§ II. *Of* Aliments *taken from* Birds.

The birds, like the quadrupeds, have two ventricles of the heart, and have a blood of nearly the same temperature with that of quadrupeds; and their flesh, or their parts which we employ as aliments, are nearly of the same qualities as those of the quadrupeds I have treated of: And therefore the general doctrine we have given with respect to the solubility, alkalescency, and nutritious quality, of those, need not be repeated here; and it only remains for us to say, in what manner the aliment taken from the several genera and species of birds may be distinguished.

Of the class of birds, according to the Linnæan system, there are six orders; *Accipitres*, *Picæ*, *Gallinæ*, *Anseres*, *Grallæ*, and *Passeres*. From the two first, as generally carnivorous animals, hardly any of our aliments are taken;* but from the four other orders a great number are employed; and we shall say a little of the particulars.

I begin with the order of Gallinæ, from which the greatest number of aliments are taken.

The species most frequently employed is the Gallus, Gallinaceus, the Cock and Hen more strictly so called, or our common dunghill fowl. Making allowance for the difference of age, the flesh of this species being always white, is the most tender and the least alkalescent, and therefore among the least stimulant of animal food. On this account, the *chicken*, or the young of this species, is most commonly allowed, when we are afraid of the ir-

* Many, if not all, the North-American species of *picæ*, consume vegetable as well as animal matters. They are very properly received into the number of our alimentary articles; and some of them are by no means contemptible food. Every American naturalist has eaten of picus erythrocephalus, p. auratus, p. pileatus, and other species of this genus. Some species of corvus, especially c. cristatus, are also eaten. But, though it seems to be, in part at least, a mere matter of prejudice, we all refuse to eat the common crows.

ritation of animal food; and upon the general principle of the young of every species being the most soluble and least alkalescent, the practice seems to be well founded. But as I observed above in the instance of veal, that the flesh of young animals is sometimes more difficultly digested than that of the old, so the fact given us by Dr BRYAN ROBINSON is an instance of it in the case of chicken: and though this cannot be supposed to be a common case, yet I think I have met with some other instances of it.

In this species, the difference depending on age is sufficiently remarkable; so that after a year old the fowls of this species, according to the advancement of their age, are constantly becoming proportionably more difficultly soluble.

Before a year old, the difference arising from sex is not very remarkable; but after that period it becomes more and more considerable.

In this species also, the effects of castration are considerable; and the *capon* and *poulard* become readily fatter, and retain their tenderness much longer, than the cock or hen whose genitals are entire.

In preparing this species for our tables, a difference of management often takes place: and though the barn-door fowl, as it is called, is certainly an unexceptionable aliment, yet it appears to me that a crammed fowl, as it is more alkalescent, so it is more sapid and tender; and for what I can perceive, a sufficiently innocent food.

Of this species many varieties are marked; but they appear to differ only in their external form, and I have not yet found that they give any difference of aliment.

Very much of the same nature with the species we have been speaking of, is the NUMIDA, Linn. or *Guiney Hen;* and this taken at a certain age, affords an aliment as tender and as little alkalescent as the species last mentioned.

We are much disposed to say the same of the GALLO PAVO or *Turkey;* and if any difference is to be assigned it is very little, and perhaps only in its being somewhat less soluble and more alkalescent.*

* It may, perhaps, be somewhat difficult for an American to speak impartially of this noble bird, which is exclusively a native of the new world, though it is now domesticated in almost every part of Europe and Asia, and in some parts of Africa. If I mistake not, the turkey is the finest bird, as an article of diet, in the whole of the gallinaceous family. When not old, I hardly know of any meat, derived from the class of birds, that is more readily soluble in the sto-

The only other domestic fowl belonging to this head, is the Pavo or *Peacock;* and this taken in whatever state, is to a considerable degree less soluble than any of the preceding species. Although vanity might have formerly set it upon the Roman tables, it is hardly ever, except in its very youngest state, admitted to the tables of modern Europe.

These are the domestic species of the gallinaceous order. Of the wild kind, the first to be mentioned is the Pheasant; which, from its nature and greater exercise, is less soluble than any of the domestic fowl; and though, from the same causes, it is more alkalescent, this does not render it, except in its very young state, very readily digestible.

Next to the pheasant, I put the Partridge and Quail kind. Of the former there is a great variety; but how far they differ as aliments, I am not exactly informed. I am, however, persuaded that it is not in any considerable degree. The partridge of this country is of a much tenderer substance than the pheasant: and though also less alkalescent than that, it is from its exercise more so than the domestic fowl. From thence its qualities as an aliment may be readily understood, as may also these of the Quail, which are very nearly the same.

The partridge and quail are put by Linnæus under the genus of *Tetrao:* and agreeable to the rules of natural history, they may be so placed; but certainly with a view to their qualities as aliments, they may be properly distinguished.

The Tetrao Urogallus, and the other *Tetraones* pedibus hirsutis, are of different qualities from those of the partridge kind or the Tetraones pedibus nudis.

Of the Tetraones pedibus hirsutis we have four species in Scotland. *The Cock of the Mountain*, a species formerly frequent in this country under the name of the Capercailzie, is now almost entirely lost. The other three species are, the *Black Cock*, or the *Tetrao Tetrix* cauda plena: the third is the *Red Game*, not known to Linnæus, and is I think the *Atagas* of Buffon: and the fourth

mach. It is, however, a fact, that the wild turkey, which is still a common bird in the forests of America, furnishes a more digestible, if not a more palatable, food. The turkey is by no means so purely an herbivorous bird as is generally imagined. The epicure ought to be informed, that it frequently devours, especially in its native forests, different species of snakes, and other animals. It is not improbable, that such aliment contributes to render the wild a more desirable food than the tame turkey.

is the *Ptarmigan*, which I take to be the *Tetrao lagopus* of LINNÆUS and the *Gelinotte d'Ecosse* of Mr BUFFON.

All these species seem to have a common quality. The three first are naturally of a tender substance; and they are still more so from their alkalescence, which is considerable. From both circumstances, they are sapid and agreeable to most persons, but at the same time must be considered as a considerably stimulant food. The Ptarmigan is a drier food, less tender and less sapid than the other three species.

[* The lover of the table will at least expect that I should say something concerning some of the North-American Tetraones, and especially the Pheasant, the Grouse, and the Partridge, which have each their admirers, but which almost every one agrees to consider as delicious food. These three birds appear to be peculiar to America. The pheasant, called also partridge, is the tetrao umbellus; the grouse, the tetrao cupido; and the partridge (which is also, and with equal propriety, denominated the quail) is the tetrao virginianus. There is, unquestionably, some foundation for the assertion, that one or more of these species of birds has occasionally proved injurious to those who have eaten of their flesh. But this injurious quality of the flesh of the American tetraones is to be especially ascribed to the deleterious vegetables upon which they have fed: one of which is the Kalmia latifolia, or American laurel, or ivy.*]

A second order of the birds affording aliments is that of the ANSERES, or the Water-fowl.

The most noted for its bulk and figure is the CYGNUS or Swan; but its flesh is firm and solid, and of so difficult solution and digestion that it is little employed as a food.

The ANSER *Domesticus* or Tame Goose, is of qualities approaching to that of the swan; but as less exercised, and living much on vegetable aliment, is of a more tender substance: but was it not for its alkalescency, it would be still a substance of difficult digestion.

Upon this account the ANAS *Domestica*, as living more upon animal food, is still more alkalescent and of more easy solution. Of both these species, the young animals, of a more viscid texture, are more slowly digested than those somewhat more advanced. Of each species also there is a tame and a wild kind; and the latter, as of more alkalescency, are more easily digested than the others.

Of this anserine tribe there are a great number besides those

enumerated that afford aliment, and are much of the same qualities with those already mentioned. With respect to most of them, as they are sea-birds and live upon fishes, they are more alkalescent, and very often on that account are tender and of easy digestion. They are commonly of a strong odour, and of a rank fishy taste, and from thence to many persons highly disagreeable; but to others, to whom their odour is not so offensive, their sapid and tender flesh is highly agreeable, and generally proves of very easy digestion. These circumstances are particularly applicable to the peculiar Scottish food, the SOLAN Goose; which to many indeed even of this country is highly offensive and entirely rejected, whilst to many others it is in the highest degree of favour.†

[*In the estimation of the epicures of the United-States, the finest bird of the whole family of the Anseres, is the CANVAS-BACK. Perhaps, it is not yet ascertained, how far the superiority of the flesh of this species depends upon the peculiar vegetable food, which it consumes, such as the wonderful vallisneria Americana, and other aquatic plants.*]

The next order of birds to be taken notice of is that of the GRALLÆ, which comprehends a great number of species of very different qualities; and I cannot find that any one quality can be found in common to the whole order. As they are birds of more or less exercise, they are accordingly of a firmer and less soluble substance; and as many of them are sea-birds, living very entirely upon fishes, they are considerably alkalescent, and in their flavour and taste come near to the nature of the anserine kinds, who resort to the same places and live upon the same diet.

The effects of exercise on the particular parts of an animal appears in birds of this tribe. The WOODCOCK and SNIPE, in which the muscles of the breast, much exercised in flying, are of a firm and less soluble texture; while the legs, little exercised, are more tender.

We are now come to speak of the fourth order of birds affording aliments, which is that of the PASSERES; a very numerous tribe, to which as alimentary we can assign no common quality: and we have too little experience of particulars to distinguish the variety that may occur here.

† I occasionally, while a student of medicine and natural history in Scotland, ate of the Solan goose; but I think that I should now find it difficult to reconcile myself to *taste* of it, unless in so far as the sight of the bird might call up to my recollection the pleasure I experienced in contemplating the Bass-island, so remarkable for the vast congregations of these fish-tasted birds.

There is one genus among those most frequently used that seems to have peculiar qualities different from most of the other *passeres*. This is the COLUMBA;† a genus of which several species might, I believe, be used, if we could obtain them in their young state; but we are only well acquainted with what is in common use, the *columba domestica*. We take this in its very young state before it has had any exercise, and in which state only it is sufficiently tender; but nature, independent of food or exercise, has made it of a very alkalescent quality, from whence it is tender; and even in its youngest state, from the same quality, it is a heating food.

[*In North-America, the species of columba which is most generally consumed,—and it is very extensively consumed,—is the columba migratoria, or passenger pigeon. The fibre of this, though not white or peculiarly seemly, is well tasted, and by no means a despicable article of diet. It is seldom, however, that it is cooked without a load of condimental matter, which prevents us from perceiving distinctly the real taste of the flesh. Its purgative property is entirely accidental.*]

Of the other passeres I can only say, that almost all of them, when they are taken in their fattened state, are sufficiently tender and easily digested; and according to their diet on grain or worms, are more or less alkalescent.

[*Among the passeres, I will barely mention a few species, which are allowed to be most delicate food. These are the emberiza hortulana, or ortolan, of the old continent; the emberiza oryzivora, or rice and reed bird, of the new continent; different species of turdus, such as turdus migratorius, called robin; and some species of caprimulgus, or goatsucker. These last, although almost exclusively insectivorous birds, and therefore theoretically avoided, are found, when brought to our table, to be excellent food.*]

I have thus finished what I had to say of aliments taken from the class of birds; and must here take notice of a very particular kind of aliment afforded, and only afforded by this class; and that is EGGS. As the substance of these is what affords a matter peculiarly suited to the formation of the young animal, it must be considered as containing a large proportion of nutritious matter: so any quantity of it taken into an animal body must be supposed to introduce a large proportion of such matter.

† This cannot, with propriety, be considered as a passerine genus. It more properly belongs to the family of the *gallinæ*; but it still more properly forms a link between the gallinæ and the passeres.

This we might suppose to require no preparation in the adult body it is taken into, to fit it for the purpose of nourishment: but this does not happen to be the case; for we, for the most part, take into the human stomach the white of egg in its coagulated state; and even when taken in in its liquid state, the first change that happens to it there is its being coagulated: so that in all cases it must be again dissolved by the peculiar power of the gastric juice, probably for the purpose of its being mixed with other matters necessary to constitute the proper animal fluid.

Digestion is a mysterious business, which we do not, in all its circumstances, well understand; and therefore we cannot at all explain the singular fact of the white of egg even in very small quantity, whether in its liquid or coagulated state, proving constantly the occasion of much sickness in the stomach of certain persons, while in the most part of other men it is an agreeable and readily digested food. It is indeed surprising what a quantity of egg may be digested by some persons; but I am persuaded that in most persons this power is very much limited, and that a smaller bulk of this than of any other food will satisfy and occupy the digestive powers of most men. At the same time, I must observe, that egg seems to me to be a less alkalescent food than almost any other animal substance, and during its digestion to be less stimulant*.

Whether egg has more or less disposition to render the body plethoric than other species of animal food, I cannot, from want of experiment, properly determine.

With respect to the particular qualities of the eggs of different birds, and whether they are in any case considerably different, I cannot clearly determine; but I am disposed to think they are very little so: and I am certain that in many instances the peculiar odour and taste of the flesh of the bird is in no degree communicated to their eggs. For example, in certain sea-fowl, whose flesh is of the rankest odour and taste, their eggs are as free from taste and smell as the eggs of our domestic fowl. Even in the latter, we can observe some difference in the taste of the yolks, and in the density of the whites; which seems to depend on the food the animal lives on. But these differences are very slender: and whether other causes may give like differences in the eggs

* The substance, however, when it is not applied to its proper function of nourishing a chick, is liable, while yet in the shell, to a peculiar putrefaction; and when eaten in that condition, is highly offensive to the stomach; and when it is to a high degree, it becomes very noxious. C.

of different birds, I cannot positively assert; but in certain different birds, the colour of the yolks and the density of the coagulated whites, are somewhat different from one another. The yolks, however, are still yolks, and the whites are still so much of the common nature of whites, that their difference as aliments is hardly to be assigned.

§ III. *Of* Aliments *taken from the class of* Amphibia.

By Linnæus this class is divided into three orders; of Reptiles, Serpents, and Nantes: but we are here to take notice only of the two first; which in their structure, œconomy, and qualities, have a manifest affinity with one another, and are very different from those of the Nantes. These, though they have some similarity in their œconomy with the Reptiles and Serpents, are so much otherwise of the nature of fishes, that they are, in every consideration of them as aliments, to be separated from the former and joined with the latter.

Of the Reptiles, the most noted, and first to be taken notice of, upon account of its being so much esteemed as an aliment, is the Tortoise. The flesh of the sea-tortoise, the only one I am acquainted with, is a white meat very much resembling that of the young quadrupeds; and from this we judge that the difference between the nourishment afforded by the one and the other cannot be great. It appears from the experiments of Mr Geoffroy, that the tortoise affords less gelatinous matter in solution, and less volatile alkali in distillation, than the flesh of quadrupeds, and consequently in equal quantities may be somewhat less nourishing and stimulant: but as it affords a gelatinous solution, and is upon this account less perspirable, it may be still very considerably nourishing, and the gelatinous parts of its substance may be particularly such.

[*I must add to this short account of the alimentary nature of the tortoise family, what would be expected of almost every American, the terrapin, or testudo concentrica. This is justly prized as a very delicate food, easy of digestion, and less disposed to excite fever, than many others.*]

The flesh of Frogs, with the use of which we are little acquainted in this country, seems, from the analysis of Mr Geoffroy, to be both in solution and distillation of the same qualities with that of the tortoise, though, as less gelatinous, to be therefore less nourishing. But however that may be, their qualities are in nowise

peculiar; and I cannot find any foundation for introducing them into bouillons or broths in that nice proportion in which they are frequently prescribed in France.

The qualities of the Lacerta *Guana*, though frequently employed in the West Indies, we are little acquainted with; but supposing their qualities to be much the same with that of the other reptiles, though the lacerta was omitted in my catalogue, it seemed proper to mention it here.

[*There is, I presume, very little foundation for the assertions of certain writers, and especially some of the earlier historians of America, that the flesh of this reptile is peculiarly unfavourable to persons labouring under the venereal disease.*]

Of the Serpentes, as alimentary, I am acquainted only with the common Viper, or *Coluber Berus* of Linnæus. The flesh of this has been suposed to be of peculiar qualities; but I cannot find any foundation for this. The flesh of the viper gives out in decoction the same substances as the reptiles above mentioned, and very much of the same qualities as the decoctions of the quadruped and bird kind.

In distillation, the viper gives out a quantity of volatile alkali; but not of any different qualities, as formerly supposed; nor, as Dr Mead imagined, in any greater quantity or proportion than what is obtained from most other animal substances. That the viper, therefore, has any very peculiar qualities as an aliment, we do not perceive; and that they have any peculiar powers as medicinal, we cannot find the slightest foundation for supposing. We must therefore consider the supposition of either its alimentary or medicinal qualities, as a mark, among many others, of the weakness and folly of the ancients, and equally of their modern followers.

[*The flesh of different species of Crotalus, or rattle-snake, such as crotalus horridus, &c., is white, delicate to the taste, and sufficiently nutritious. Those who have once tasted of it, and of its preparations, will probably wish to return to the use of them again. We have seen the officers of a British camp in North-America, prefering rattle-snake soup to almost every other preparation of animal food. How far there is any solid foundation for the reports of many persons, in America, that the flesh of these reptiles is peculiarly adapted, as a restorative, to cases of pulmonary consumption, I shall not positively determine: but I venture to conjecture, that an indulgence in this kind of food cannot prove

less injurious than an indulgence in many other kinds, equally stimulating and nutritious.*]

§ IV. *Of* Aliments *taken from the class of* Fishes.

On this subject writers commonly begin with marking fishes as different, according as they inhabit rivers, fresh-water lakes, or salt waters : but I cannot find any foundation for the distinction, as I cannot find any steady general character to be given to them as they inhabit those different waters, or any distinguishing quality that does not in some instances take place in each of them.

We are therefore to consider fish in general as distinguished from the three classes of animals already treated of; which we shall generally speak of under the appellation of Meats; and the difference here is very considerable.

When we began to speak of aliments as taken from quadrupeds and birds, we remarked that the similarity of substance and œconomy in those animals to that of man, gave little difficulty in supposing that the former might be alimentary with respect to the latter; but here, with respect to fishes, there is no such analogy to direct us: and it would be difficult to determine, *a priori*, that the substance of fishes must prove alimentary to man. They have indeed several properties in common with other animal substances, as that of yielding a volatile alkali in the first part of their distillation, and that of their being putrescent. But these circumstances would hardly be enough to point them out as alimentary substances to man; and therefore the proof of this rests entirely upon experience, which has shown them to have been at all times, and in every part of the earth, employed successfully as aliments. It is said, that in some parts of the earth there are people who live entirely upon this kind of aliment; and it is certain that with many people it is the chief part of their food. In such cases it appears to be perfectly sufficient for all the purposes of the human œconomy; and whether it is in any case insufficient or less fit for these purposes, we shall consider presently, when we shall have first considered the differences that appear between the substance of these and that of the hot-blooded animals.

There is certainly some difference in the firmness of the substance of different fishes; but it is never so considerable as it is in the three classes of animals above treated of: and it is curious to observe, that although fishes are long lived animals, yet the difference of firmness of texture at different ages is seldom remark-

able. It is also to be remarked, that although the substance of fishes is putrescent, and at length becomes entirely putrid, yet their putrefaction is with different circumstances from that of the hot-blooded animals. This, however, has not yet been studied by the chemists ; and I am unable to say what are the different states of it in its progress, and therefore how far it affects them as an alimentary matter. I cannot truly perceive that it renders it more soluble or much more irritating to the system, as it does in the case of the meats above treated of.

There is, however, a case in which certain fishes, independent of the state of their putrescency, give a singular irritation to the system. It is during their digestion in the stomach that certain fishes are ready to occasion a considerable efflorescence upon the skin ; sometimes in certain parts of it only, but sometimes over the whole body ; sometimes with a considerable febrile disorder, but at other times with very little. It is seldom of long duration, and commonly passes away by the time that the matter is entirely digested and passed out of the stomach. In some cases I have had it immediately removed by a vomit, bringing up the contents of the stomach.

By all this it appears, that the phenomenon depends upon an operation upon the stomach, and not upon any matters being mixed with the blood : and it may be a question, Whether it depends upon an operation upon the nerves of the stomach communicated to the skin, or upon the operation of the substance of fish determined more particularly to operate upon the surface of the body ?

This leads to a question, How far the substance of fish is an aliment more or less perspirable than that taken from the hotblooded animals ? I took notice above of Sanctorius's opinion of the perspirability of mutton, and of Dr Keill's opinion of the imperspirability of oysters, which are a substance somewhat similar to that of fishes ; and though I observed that De Gorter's experiments had not confirmed either of these facts, yet I allowed that the matter might, and deserved to be, a subject of farther inquiry. By what experiments I have been able to make, it appears to me that the substance of fishes is an aliment somewhat less perspirable than that of meats.

In the comparison of these two kinds of aliment, the circumstance that especially demands our attention, is the quantity of nourishment they severally afford. The common opinion is, that

fish afford a weaker nourishment than meat does: and Dr HALLER found himself weakened by a fish diet, and alleges that persons are generally weakened by a Lent diet; and the observations of PECHLIN seem particularly to confirm this. But there may be much fallacy in these observations, as the weakness alleged may be owing more to the quantity of vegetable aliment employed at the same time than to that of the fish. I have known several instances of persons who felt no weakness from a Lent diet when a great deal of fish was taken; and we have several instances of villages inhabited almost only by fishers, and who therefore live very much upon this sort of aliment, but in whom no diminution of health or vigour appears. It will therfore be very doubtful if fish afford much less nourishment than meat does; and I am persuaded that, if any, the difference is very inconsiderable.

Whilst I make these observations on fishes as an aliment in general, I wish I could distinguish the different qualities of particular fishes: but I find it difficult to speak clearly or positively upon the subject, as no experiments that I know of have been made to determine the matter. It appears that some difference will arise from the difference of texture, and that the tenderer and more gelatinous kinds, as occurs especially in the cartilaginous fishes, will be more easily digested, and more nourishing, than those of a firmer and drier texture. It has been alleged, that fishes, as having less oil in their substance than our meats have, should be therefore less nourishing; and this is alleged with some probability: but how far it goes, it is difficult to determine; for in many fishes, the quantity of oil in their substance is inconsiderable: and I would venture to lay it down as a truth, that the oily fishes give an aliment less easily digested, more irritating to the system, but at the same time more nourishing than the leaner. We seem to have examples of this in eel, salmon, and herring: and with regard to the last, I might have observed, when speaking of the nourishment afforded by fish in general, that our herring-fishers, living for some length of time upon this aliment alone, suffer no loss of strength, and seem rather always to be much fattened by this diet.

I can hardly say more on the alimentary qualities of fishes, not having had the opportunity of experience with respect to the great number and variety that are employed as aliments; I can find very few experiments that have been made to ascertain their different qualities: and it appears to me that they have been chosen by their taste, rather than by any proper experience of their nutritious qualities.

From some experiments, it appears that the aliment taken from fishes is less perspirable than that taken from the hotblooded animals; but I believe that more experiments will be necessary to ascertain this matter more exactly.

§ V. *Of* Aliments *taken from* Insects.

Of this numerous class very few are employed as aliments in this part of the world; and I can hardly take notice of any but certain of the Crustacea, as the Lobster, Crab, Prawn, and Shrimp, which are those only that are seen very frequently upon our tables. The Crustacea are indeed of much greater variety; and perhaps many of them, in other parts of the world, may be used in diet: but they neither come within my plan, limited to British aliments, nor have I any proper acquaintance with those others.

With respect to the Lobster and Crab, I am of opinion that they hardly differ in any quality from one another; and that it is only the more elegant appearance of the lobster that makes it appear much more frequently than the crab upon our tables.

The substance of both gives out in decoction a considerable quantity of matter: but this does not determine the quantity of nutritious matter to be greater than what may be extracted by the gastric fluid from other substances which do not give out so much in decoction; and the smaller proportion of volatile alkali that is obtained from their entire substance, or from their extract, makes me presume upon their containing less of animal substance than the flesh of quadrupeds, birds, or even of the amphibia.

With respect to them as aliments, we are disposed to conclude them to be much of the nature of the most part of fishes. They particularly approach to the nature of many of these, in being without oil, or in having it in very small proportion; and therefore, in my opinion, affording less nourishment. They appear to be of more difficult digestion than the most part of lean fishes.

With respect to their digestion there is somewhat peculiar often happens, as I have known several instances of persons who could not take even a very small quantity of lobster or crab without being affected soon after with a violent colic, and sometimes with that same efflorescence on the skin which, as we said above, often happens from eating salmon or herrings. In both cases, I believe it happens especially from the idiosyncrasy of particular persons; and how difficult that is to be explained, will appear from what we said above on the subject of Eggs.

§ VI. *Of* ALIMENTS *taken from the Class of* WORMS.

Several of this class are used as aliments, but not many in proportion to the number of species which the class comprehends. I shall mention those only which come upon our tables here; which is the circumstance that has given me the opportunity of being acquainted with them.

They are chiefly the animals included in the TESTACEA. The Bivalves afford several; the chief of which is the OYSTER. This, in its fresh and raw state, is of easy digestion; but in its boiled or roasted state more difficult, and often very much so. The oyster seems to be considerably nourishing, and it may be more so, because it is not readily perspired. Dr JAMES KEIL, in his experiments, found oysters not only difficultly perspired, but that they even prevented the perspiration of other aliments. SANCTORIUS may be supposed to say the same thing, *Aph.* 438.; but it seems to be difficult to make any thing of his opinion, when he reckons the Ostracea among the flatum gignentia. DE GORTER positively asserts, that in his experiments the imperspirability of oysters did not appear: but from some trials I have made, I am disposed to judge, that oysters are less readily perspired than some other foods.

The other Bivalves chiefly employed in this country, are the MUSSEL and COCKLE; neither of them, as being of a firmer substance, are so easily digested as the oyster; but in other respects they are seemingly of the same qualities.

The mussel is reported to have, upon several occasions, produced very noxious effects, and given occasion to a suspicion of its being, in certain circumstances, poisonous, or of its carrying a poisonous matter along with it into the stomach. As, however, we do not meet with such accidents in this country, though the mussel is very frequently and largely employed in our diet, I am at a loss to judge of this matter. No writer that I know of has determined the nature of this poison, or of the state of the mussel that renders it upon occasion noxious; and I am ready to suspect that most of the instances of this disorder imputed to mussels, depend either upon an unusually large quantity being taken, or upon an idiosyncrasy in certain persons, rendering them liable to be affected by mussels, in the same manner as we have said certain others are by salmon, herring, and lobster.

Of the Univalve Testacea, the chief is the SNAIL, COCHLEA *pomatium*. This is of a tender substance, and therefore easily digested; and from its gelatinous state it is supposed to be very nourish-

ing. I verily believe it to be so; but in what proportion is not ascertained. They are commonly employed upon the supposition of their nutritious qualities in cases of emaciation; and they have been often, in that view, employed in cases of hectic fever.

In materia medica writers, they are constantly mentioned as refrigerant; but nothing can be a greater mistake, for they are still animal substances; and nothing of this kind can be refrigerant, though some of them may be less heating than others.

As all the animals found in univalve shells which are employed as aliments, are of the same genus, I believe what we have said of the snail may be applied to all the others. We must own, indeed, that we have not had a proper opportunity of observing the difference: but, in the mean time, are persuaded that it is very inconsiderable.

The Cookery of Meats.

We have now finished our enumeration of the aliments taken from both vegetables and animals; but in order to judge still more exactly of their effects taken into the body, it will be proper to consider, as well as we can, what changes they undergo by the cookery they are subjected to before they are taken into the stomach.

This consists chiefly in the application of heat; and with very few exceptions, this is applied more or less to the whole of animal substances. It is, indeed, in the business of aliments by this especially, that man is distinguished from all other animals, who take food as nature offers it; and at least, I know of none of the brute creation that practises any art of preparing their food by subjecting it to heat. If they use any food so prepared, it is only such as has been prepared by the artifice of men.

How far any part of our vegetable aliments is necessarily subjected to heat is not certain; and I do not recollect any species of vegetable substance that may not be taken in its raw state by men of tolerable health and vigour. But, at the same time, the whole of them are upon occasion subjected to a preparation by heat; and mens being directed by instinct so universally to this practice, implies, that in many cases it is proper, and attended with some advantages.

These advantages seem to be, in the first place, that the most part of vegetable substances are thereby rendered more soluble in the human stomach. The only doubt that can arise with regard to this is in the case of vegetable substances, to which, in their crude

state, a boiling heat is immediately applied, and thereby in many of them a coagulation is produced; in consequence of which they seem to be rendered less soluble in water than they were before: but this does not seem to have any effect on their solution in the stomach. Whether the difficult solution be obviated by some degree of fermentation that necessarily takes place in the stomach, or by the powers of the gastric fluid, it is not necessary to determine, as it remains certain that the action of heat separates in some measure the small particles of bodies; and thereby renders them more readily separable by the solvent powers of the stomach.

In the second place, the application of heat separates and dissipates the volatile parts of vegetable substances, which are seldom of a nutritious nature, and, in many cases, have a tendency to prove noxious.

In the third place, the application of heat to a certain degree extricates and dissipates a considerable quantity of air, that in the natural state of vegetables is always fixed in their substance; and it is probably in this way especially that heat contributes to the dividing and loosening the cohesion of the small parts of vegetable substances. It is certainly in this way, by dissipating a large portion of their air, that vegetables are rendered less liable to fermentation, and less liable to produce that flatulence which is upon occasion so troublesome in the stomach and intestines. On what occasions especially these preparations by heat are proper and necessary, we have frequently hinted above on the subject of particular aliments: and it is only necessary to observe further, that as the heat may be employed in two ways, either in a humid or in a dry form, we are of opinion, that the former is always better suited than the latter to all the purposes above mentioned.

The cookery of animal substances also consists chiefly in the application of heat. It is, indeed, possible that some practices, previous to that application, may be considered also as parts of cookery, particularly salting, drying, and pickling. These practices, however, are merely useful for the purposes of domestic œconomy, as preserving meat from putrefaction, before it be subjected to heat, for a longer time than it could be preserved without such means.

We are, at the same time, of opinion, that these practices can never increase the nutritious quality of meat, or render it even of more easy digestion. Drying certainly brings the solid parts of meat more closely together, which must render it of more difficult solution. The addition of salt, which stimulates the stomach, may

seem in some cases to promote digestion: but this must be when the salt is added in small quantity, and when the meats preserved by it are taken in moderate quantity only. For when meats have been long salted they are hardened, and rendered in proportion less soluble in the stomach; and a large quantity of salt accompanying them is certainly hurtful to the system.

There is one preparation of animal food which is made without any addition, and that is by its being kept for some time before it is subjected to cookery, longer or shorter according to the season and nature of the meat, but always till it has made some advance towards putrefaction. The tendency to this seems to take place from the moment that life is extinguished in the animal; and that the allowing it to take place to a certain degree renders the meat more easy of solution in the stomach; and if the putrescency is in a moderate degree only, it does not seem to hurt the nutritious quality of the meat. How far the putrescency may be properly carried, I cannot determine; but certainly it may be different according to the constitution of the person.

There are persons who seem to suffer no inconvenience from meats, though in a very putrescent state: but although there are persons who can digest tainted meats, that is, meats having the taste and odour which we know to arise from putrescency, yet I know many others in whom the digestion is much disturbed by the smallest quantity of meat tainted by putrescency. But however all this may be, we are clearly of opinion that the keeping of meat for the purpose mentioned above should never go far; for very certainly every advance in meats towards putrescency, renders them more ready to increase the spontaneous tendency of the animal fluids to that state which we take to be always hurtful to the human constitution, as it both favours the coming on of diseases, and aggravates their symptoms and danger when they do come on.

We come now to consider what is properly the cookery of animal substances, or the preparing them by the application of heat. This is of two kinds, as it is applied in a humid form in *boiling* and *stewing*; or in a dry form, in *roasting*, *broiling*, and *baking*.

Boiling is properly the exposing of meat to the heat of boiling water, while it is immersed in this for some length of time. By this joint application of heat and moisture, the texture is certainly rendered more tender and more soluble in the stomach; and it is only in this way that the firmer parts, as the tendinous, ligamentous, and

membranous parts, can be duly softened, and their gelatinous substance duly extracted.

With respect to the parts of animal flesh that are of a tenderer texture, the effects are different according to the degree of boiling that is applied to them. A moderate boiling may render their texture more tender without much dimunition of their nutritious quality; but if the boiling is extended to extract every thing soluble, the substance remaining is certainly less soluble in the stomach, and at the same time much less nutritious. But as boiling extracts in the first place the more soluble, and therefore the saline parts; so the remainder, after boiling, is in proportion to the length of that less alkalescent and less heating to the system.

Boiling is commonly practised in open vessels, or in vessels not very closely covered: but it may be practised in *digesters*, or vessels accurately and tightly closed; and in such vessels the effects are very different from what they are in open vessels. As we can hardly employ any other degree of heat than that of boiling water, the water in the digester is never made to boil, so there is no exhalation of volatile parts: and although the solution is made with great success, and may be to any degree required, yet if that is not carried very far, the meat may be rendered very tender, while it still retains its most sapid parts; and this kind of cookery will give always the most desirable state of boiled meat.

Boiling in the ordinary way may be considered as different according to the proportion of water applied. If a small quantity only is applied, and the heat in a moderate degree is continued for a long time, this is Stewing, and has the effect of rendering the texture more tender, without extracting much of the soluble parts; and this, therefore, leaves the meat more sapid, and sufficiently nourishing.

The other application of heat is in a dry form, or when the meat subjected to it is in a dry form, or nearly so; at least it is without the addition of water or other fluid that may dissolve any part of its substance. This application of heat is again of two kinds, as it is in close vessels, or as it is exposed to the free air.

The first is Baking; and though commonly in this practice the cover of the meat is only of paste, any considerable exhalation is prevented, and the retention of the juices under the application of heat renders the meat more tender: and in all cases when the heat applied loosens, and in some measure extricates, the air, without exhaling it, the substance is rendered more tender than when with any other application an exhalation is allowed.

In BROILING an exhalation takes place; but as the heat of a naked fire is more nearly applied, the outer surface is in some measure hardened before the heat penetrates the whole, and thereby a great exhalation is prevented, while the whole is rendered sufficiently tender: but this kind of cookery is especially suited to meats that are chosen to be eaten a little rare.

Nearly a-kin to this dressing is that of FRYING: but as in this the meat is cut into thin slices, and laid in a vessel which is interposed between the meat and the naked fire, the heat is applied more equally to the whole substance. But as the part of the meat lying next to the bottom of the vessel would be suddenly hardened by the heat, it is always necessary to interpose some fluid matter. When this, as most commonly it is, is of an oily matter, as a strong heat applied to such matter is ready to render it empyreumatic, or at least less miscible with the fluids of the stomach; so all fried meats are less easily digested than those of any other preparation, except that sometimes the same may happen to baked meats, to which an oily matter, and that only, is added to avoid the too drying heat. It is obvious that the preparations of stewing and frying may be frequently joined together; and according to there being more or less of the one or other, the effects may be judged of.

The manner of applying heat yet to be mentioned is the frequent one of ROASTING. In this, as by a proper artifice an equal application is taken care of, the effect of heat in rendering the meat more tender is certainly obtained; and though a considerable exhalation is made, it is almost only of a watery humidity. This indeed would take place to a very great degree, and render the meat again more insoluble, were it not that large masses only are subjected to this operation, and that thereby the outer surface is first condensed, and prevents the exhalation from the interior parts. At the same time, an oily matter is commonly and repeatedly applied to the outer surface, which prevents both much exhalation and any great hardening of the outer surface, till the heat has penetrated the whole, and rendered it sufficiently tender. From all which the effects of roasting, and the proper conduct of it, may be understood.

Having thus explained as well as we can the chief parts of cookery, and their effects as consisting in the application of heat, we have only to observe, that meats, as presented upon the table, differ further only, by the difference of sauces, or humid matters,

which are employed to obviate the dryness of meats, and to render them more agreeable to the taste.

The sauces have for their basis oily matter or strong gelatinous extracts from other meat; and both these rendered more agreeable by the admixture of some other alimentary matters, and more poignant by the addition of various condiments: the effects of which in the stomach and mass of blood will be understood from what we are presently going to say of them.

CHAPTER III.

OF DRINKS.

UNDER the titles of Aliment, Food, or Meat, I comprehend every thing, whether solid or liquid, that can serve for supplying the solid matter of the human body; and under the title of Drink, I comprehend every liquid that is fit to supply the watery parts both of the solids and fluids.

How much water enters into the composition of the fluid, and even the solid, parts of our bodies, is well known; and it is equally well known that the same water, by various means, is in continual dissipation and waste, and consequently that a constant supply of such liquid is absolutely necessary to the support of the system. That such a supply may be duly made, nature has given the appetite of thirst, which leads to the taking in of drink.

The drinks we take in are seemingly different matters; but the supply mentioned may be made by pure elementary water alone; and that all the drinks which supply the necessary liquid, do it only by the quantity of elementary water they severally contain, will, we suppose, be readily allowed. Our drinks, therefore, may be considered as of two kinds; one consisting of water alone, such as nature affords it; and another whose basis or principal part is such natural water, but with certain additions made to it by nature or art.

SECT. I.

Of Simple Water.

THIS, so far as I know, is the only liquid taken in under the appetite of thirst by the whole of the brute creation; and from

thence it may be presumed to be the liquid in general very well suited to the animal œconomy. That it is sufficiently suited to man, will appear clearly from the great part of mankind who, during the course of their lives, take in no other. It is true indeed, that men in their infancy take milk from the breasts of their mothers; and there are some people who take much milk through the course of their lives: but there are certain nations who have no domestic animals to afford this, and therefore for drink must depend upon water alone; and the state of health in those persons who, from various causes, take water only, shows that this is perfectly well suited to the purposes of the human œconomy.

Simple water, therefore, that is, such as nature affords it, is without any addition the proper drink of mankind. But though I have used the title of Simple Water, it must be remarked that nature hardly ever affords water perfectly simple, or without its being more or less impregnated with some other matters; and upon this account a distinction has been made of the natural waters, as being from different impregnations more or less proper for the use of man. How far this distinction is to be prosecuted, I dare not determine; but I am much disposed to establish this doctrine, That it is not to be prosecuted with much nicety, because we are of opinion, that every natural water which has no impregnation sensible to the taste or smell of a person of common sensibility drinking it, is very well fitted for the drink of mankind.

Still, however, it is observed, that certain waters which have neither taste nor smell, are however discovered to have certain impregnations that may be considered as less salutary to mankind than more simple, or what may be called more pure, water.

This may be supposed to take place especially in the waters distinguished as Hard and Soft. The former are impregnated with a portion of selenites, or other earthy matter, which renders them improper for certain purposes of domestic œconomy, and might be supposed to render them less salutary than purer and softer waters to the human constitution. Without entering, however, into any nice disquisition upon this subject, it will be enough to say, that the softer waters, when in our choice, are to be preferred: but at the same time we cannot discover that the harder waters, even when they have been very much and constantly employed, have been very evidently hurtful; at least we can find no good or clear evidence of the bad effects that have been ascribed to them.

I lived for many years in a large city in which the waters very

universally employed were very hard, and although softer waters were within their reach, the most part of the people used only the hard. But among this people I found no endemic diseases; and at least none that I could impute to the water they drank, and certainly none that I did not find as frequent in a city which I have also practised in for many years, whose inhabitants very universally used no other than a very soft water.

Physicians have entered into still nicer distinctions of common water, and have distinguished them as they are Spring waters, Pit-well waters, River waters, or Lake waters; but there seems to be little foundation for distinguishing these from one another. Uncommon impregnations of some of them may upon occasion take place; but we believe such will always be apparent enough to prevent their being used: And with regard to their common state, it is still enough to say, that no impregnations which are not sensible to the sight, taste, or smell, are of so much consequence as to deserve our attention and choice in their employment.

On this subject it would be thought strange if I should omit to mention Rain and Snow water, about which so much has been said. We have, however, only to say, that although these are perhaps the softest and purest of all common waters, yet I cannot perceive that in their use they give any advantages above others; and, on the other hand, we are persuaded there is no foundation for supposing some of the particular bad effects of snow-water that have been ascribed to it.

We conclude the whole subject with remarking, that the nice and accurate examinations that have been made of the state of what I call Simple or Common Waters, were very commendable; but now they are made, they do not lead me to think that much nicety is necessary in the choice of them: and with respect to the bad effects imputed to some of them, we do not find there is any foundation for supposing that any of them can produce scrophula, fatuity, or other diseases, alleged to be endemic in certain countries.

The consideration of mineral waters belongs entirely to another place.

SECT. II.

Of DRINKS *whose Basis is Water, but to which Additions have been made by Nature or Art.*

TO be employed as drinks, various additions have been made to water; as the acid juices of fruits, farinaceous matters, aromatics,

tea, coffee, and other vegetable substances. In so far as these, though joined with water, retain their peculiar qualities, the qualities of the drink made by such additions, must depend upon the quality of the matter that has been added to the water; but as the qualities of these matters have either been treated of already under the title of Aliments, or are to be treated of hereafter under that of Medicine, it is not necessary here to consider further the nature and qualities of such drinks.

Fermented Liquors.

There are, however, substances which, joined with water, make the liquor undergo a considerable change, by its being subjected to a vinous fermentation: and as liquors thus prepared are employed as drinks in every civilized nation, they properly become objects of our particular attention, and are therefore to be considered here.

These fermented liquors may be mentioned in the *first* place as of two kinds; one of them, prepared from the juices of fruits, and which, from the appellation of the principal species, we name Wines; the other, from a substance extracted by water from certain seeds or roots, which we name Ales: and we begin with the consideration of the former.

On this subject we do not think it necessary to give the general doctrine of vinous fermentation, which we suppose to be commonly known. Here we shall only say, 1*st*, That we take it to be now well ascertained, that sugar, or substances containing it, and these so far only as they contain it, are the subjects capable of being changed by fermentation. 2*dly*, That by fermentation the sugar is variously changed, and particularly that in part it is converted into alcohol, which I need not here define; and that it is the juice of fruits, in consequence of fermentation impregnated with a portion of alcohol, that properly and strictly constitutes a Wine; and that it is the state of this, with some other matters originally in the subject, more or less modified by the same fermentation, that gives wine all its different forms and qualities.

By its sensible qualities and other properties to be discovered in it, wine is found to be in different conditions; and it is our chief business here to take notice of these, and to investigate their causes, so that we may better ascertain the effects of particular wines both in diet and medicine.

To this purpose we would allege, that, in general, the different condition of wines depends partly upon the nature of the matter

subjected to fermentation, and partly upon the circumstances occurring in the conduct of this.

With respect to the first, the chief difference that occurs is in the quantity of sugar it contains; and it seems only necessary to consider this as it occurs in the juice of the grape, from which most generally wine is prepared.

The botanists commonly suppose that the vine is a plant of one species only; and that the diversity which appears in its fruit, points out to them only so many instances of a variety, that by different causes may be produced in the same species.

For ought I know this may be just: As the wine is propagated by cuttings, the same variety may steadily continue to appear; and the cuttings having been taken from vines in different condition, we may have a variety of fruits, in which a difference in the nature of the subject may continue to appear: which, however, we still suppose to be always determined by the quantity of sugar they severally contain.

This quantity, however, in any grape, may be varied considerably by different circumstances. And, 1*st*, the kind of grape being given, the quantity of sugar it contains may be different by the soil in which it grows, as this is more heavy or light; the latter giving less juice: but this more perfectly ripened, and therefore containing a greater proportion of sugar.

2*dly*, It may be more or less saccharine according to the climate in which it grows. It is heat that gives maturity to fruits; and therefore to the production of the saccharine matter they contain: And with respect to the grape, it may be confidently said, that, within certain bounds, the more heat the grape is exposed to, the more maturity it acquires, and the more saccharine matter it will contain. It is asserted, that a certain temperature of climate is necessary to give the greatest perfection to the grape; and that this is from the twentieth to the fiftieth degree of latitude on each side of the equator. This perhaps is not yet, by accurate observations, exactly determined; but it is pretty certain, that while beyond fifty degrees, the ripening of grapes is commonly imperfect, it is always more readily so as the climate is, within the bounds mentioned, nearer to the equator.

3*dly*, The saccharine matter of the grape will be always greater as the fruit is allowed to acquire more maturity, by remaining long on the tree where the climate allows of it.

4*thly*, It is to be observed, that the saccharine juice of the grape is often accompanied in the same fruit by acid and acerb juice;

which may be considered as both diminishing the quantity of saccharine matter, and rendering it less fit for fermentation: and this happens both from the original nature of the grape and from its not attaining a full ripening. If the ripening, therefore, be not complete, as we know that all fruits ripen by degrees, and very often when the juice of the fruit in its central parts is fully ripened, there is an acid and acerb juice still remaining in their cortical parts or husks; so we find, that, according to the manner of the expression of the juice, it comes out in a different degree of fitness for fermentation. What flows upon a slight pressure only, is a more purely saccharine juice, while that flowing, in consequence of more forcible expression, is always less sweet; and according to the greater force employed more acid or acerb.

These are the circumstances of the grape, which, according to their state, may give considerable differences in the condition of wines.

In the *second* place, we suppose the difference of wines to depend upon circumstances in the conduct of the fermentation.

This at first is active, and somewhat violent, throwing up a great deal of the matter to the surface of the whole: but after a certain time, the brisk intestine motion becomes much less; and instead of throwing up matter to the surface, allows what had been formerly thrown up to fall down to the bottom. After this, however, some fermentation continues, though in a more slow and inactive manner, which may continue for a long time; and its doing so is necessary to a more complete assimilation, and therefore to the formation of a more perfect wine.

In this process, the quantity of fermentable matter being sufficiently large, the more active the first fermentation is, within certain bounds, the greater quantity of alcohol will be produced, and therefore a stronger wine; and the longer the slow fermentation is protracted, the more perfect will be the wine, and the more free from all other matters adhering to it. But if either the first active fermentation be hurried, or the second fermentation be pushed too far, the whole of the wine, or a part of it, will be converted into a vinegar, of very different qualities from the wine, or from the parts of it which still retain that nature.

From this view of the fermentation, it will readily appear, that what is frequently considered as a wine, and such indeed as are most of the wines in use, it may contain three different matters. 1*st*, A portion of must, or unassimilated matter. 2*dly*, A portion of a proper wine, or in which, by the fermentation, a quantity of alcohol

is produced; and, *3dly*, A portion of vinegar produced by a too active or a too long protracted fermentation.

These different matters will appear more or less copiously at the different periods of the fermentation. At an early period, and in what may be called a new wine, the must will be most abundant. As the period of fermentation advances, the proportion of genuine wine will be more considerable; and if the fermentation has all along been properly managed, a vinegar will not appear but in very old wine; and from the proportion of these several matters, the qualities of wine depending upon the period and state of fermentation, may be properly ascertained.

New wines are especially liable to a strong degree of acescency when taken into the stomach, and thereby to occasion much flatulency and eructations of acid matter. The uneasy sensation of heartburn, or of violent pains of the stomach from spasms, is thereby also often produced; and the same acid matter passing out of the stomach, is liable, by a mixture with the bile, to produce painful spasms or colics in the intestines, and of exciting violent diarrhœa.

Ripe and perfect wine, unless there is a fault in the stomach taking it in, is not ready to have these effects; and by the alcohol it contains, it is fit to strengthen the stomach, and to promote a regular digestion. By the same alcohol also, it is fit to stimulate the whole system, and proves thereby cordial and exhilarating, but by the same matter taken in larger quantity, it becomes intoxicating and a powerful sedative.

Wines containing a portion of vinegar have thereby a proportion of their alcohol destroyed, and thereby the stimulant power of the wine lessened. At the same time, though the vinegar be less liable to a hurtful acescency in the stomach than the unfermented juices; yet if there remains any such unfermented matter in the other parts of the wine, or otherwise accidentally present in the stomach, the vinegar or acetous acid may, by exciting an acetous fermentation, occasion very violent disorders, and often more violent than those arising from spontaneous acescency.

We have thus endeavoured to explain, in what manner wines may be in different conditions according to different circumstances in the conduct of their fermentation; but we are far from being able to apply these distinctions to the wines in common use, as we are not sufficiently acquainted with the various practices employed by the makers of wine in different countries; and much less with the various artifices employed by merchants or wine-dealers, to hide

and disguise the real state of wines. Instead of entering upon these, we shall endeavour to say, how in some measure the nature of wines may be judged of by some of their sensible qualities.

Wines are of somewhat different odours; but what qualities these different odours point out is by no means ascertained. In general, the peculiar odour of any wine being strong and vivid, always implies both the most perfect and the most entire state of such wines, providing always that this is examined in wines of some age, as new wines under a more active fermentation may give out a more striking odour; this, however, to be distinguished by the experienced from that of a perfect wine.

With these circumstances of odour are much connected the briskness or flowering in the cup of wines, which always shows their being still under some active fermentation; and for the most part that there has been a quantity of acid present in the original juice.

There are, however, wines very well ripened, and in which there is no very active fermentation subsisting, that notwithstanding will, upon a fresh application of air, and some agitation in being poured out, readily flower in the cup; but their being in no improperly active fermentation will readily appear, by the flowering passing again immediately away.

With regard to tastes, some wines are considerably acid; and this must be owing to their having been made of juices containing much acid and little sugar: and for which reasons they are wines containing little alcohol. But it is to be observed of such wines, that many stomachs are fitted to obviate their acescency; and as the acid in some measure obviates the stimulant power of alcohol, if such wines are not directly refrigerant, they are at least less heating.

We have mentioned above, that wines may appear acid from a quantity of vinegar formed in them: But this kind of acidity will be very readily distinguished by the freshness accompanying the former, and the vapid state frequently attending the latter.

Many wines are remarkably sweet, and may be so from different causes. It sometimes depends upon the original sweetness of the grape, not to be entirely obliterated by any fermentation; and by a complete fermentation the same may be made into the most perfect wines. The sweet wines, however, may be always suspected of retaining a portion of unassimilated matter, especially when the active fermentation has been industriously checked; and unless these circumstances are compensated by a large proportion of alcohol pro-

duced in them, they will always be ready to show the effects of unassimilated matter remaining in them.

Wines may be more rough, and somewhat styptic or more soft and smooth to the taste. The former commonly accompanies the acid wines, and may be owing to the original acidity or acerbity of the fruit; but most commonly it is owing to the juice of the husk taken out by too strong expression; and that even from grapes otherwise containing a great deal of saccharine matter. It is a quality that renders wines more astringent; but unless as depending on the causes disposing it to much acescency, it is otherwise innocent. It appears always most considerable in new wines, and is much smoothed by a long protracted fermentation. Hence soft and smooth wines, whilst they show both the original juice to have been free from any acerbity, they presume also the most perfect fermentation.

We have now only to take notice of wines that are distinguished by their colour; which, as it is so frequently given by art, renders us very uncertain of the qualities that would have been in the colourless liquor.

So far as the red colour of wines is without the addition of colouring matter, I believe it is always taken from the colour of the husks subjected to the first fermentation of the juice; and therefore gives to these juices, and the wine made of them, some degree of roughness and astringency: and if the conduct of the fermentation is otherwise the same, it is only in this quality of a slight astringency that we can perceive red wines to differ from white. It is, however, possible, that as wines are at first intended to appear white or red, that they may be subjected to a different management in the fermentation, and thereby may differ more considerably in a manner that I am not acquainted with.

We have thus endeavoured to point out the different condition of wines, and to assign their several causes: and we might now make some remarks on the wines that are made from the juices of other fruits than that of the grape, as those of apples, pears, cherries, and also of those made in imitation of wine from sugar or honey. But we are persuaded, that the principles laid down with respect to the wine made of the juice of the grape, will apply to all the other kinds mentioned; and we have now only to say somewhat of the other principal species of fermented liquors which are called Ales.

Fermented liquors affording alcohol may be made from the roots of several vegetables; but these, so far as I know, have not been

made into potable liquors: and these liquors, or what I call Ales, have only been prepared from farinaceous seeds.

These, by malting, or by exciting and conducting their germination to a certain degree, have always a sugar evolved, and rendered evident in their farinaceous substance; and this saccharine matter extracted by water, subjected to a fermentation analogous, and very similar, to that of wines, gives our ales containing a quantity of alcohol. They have, therefore, in general, the cordial, exhilarating, intoxicating, and sedative qualities of wine.

These ales, like wines, are found in various condition, depending partly upon the quantity and condition of the saccharine matter employed, and partly upon the management of the fermentation they are subjected to.

Ale may be prepared from any of the Cerealia. Barley has been chiefly employed, and we think properly, as its germination is most easily conducted; and that under its germination, it gives out its sugar most readily and in greatest quantity: and though the other farinacea may be employed, it is alleged, that they would severally give an ale of a different quality. This, however, we judge to be without foundation; and are persuaded, that the ale prepared from the other farinacea, would not show any essential differences from that of barley. SPIELMAN says, that ale prepared from oats is bitter; but I have seen it often prepared from that grain without any bitterness, and proving in every respect a very perfect ale; hardly to be distinguished in any quality from that made of barley.

Now, however, to speak of ales made in the ordinary manner, they will be stronger or weaker, according to the quantity of the saccharine matter employed in them: which will be more or less according to the quantity of well-ripened farina in the barley employed; according to the more or less exact conduct in the malting of it; according to the proper and complete extraction of the saccharine matter by water; and when a large proportion of water has been necessarily employed for a more complete extraction, according to the dissipation more or less of a quantity of the superfluous water.

These are the circumstances, according as they are managed, which give strength or weakness to ales; and with respect to their other qualities, they will depend upon the conduct of the after fermentation.

The infusion of malt or wort, as it is called, is not so well disposed to fermentation as the juices of fruits, and therefore re-

quires a ferment to be added to it; and that being added, the conduct of the fermentation is very much the same with that of wines; at first very active, and afterwards slowly protracted for a long time: but however managed, it is very doubtful if the ale ever can be rendered so perfect and complete as in the case of wine. It is probable, that in most ales, there is a large portion of unassimilated farinaceous matter, which therefore renders ales more nourishing than wines; but, for the same reason, ales, *cæteris paribus*, are more than wines liable to acescency in the stomach. It is commonly supposed, that the vicidity of worts is never entirely corrected by the fermentation; and therefore that ales are more ready than wines to fill the vessels of the human body with viscid fluids: but I am persuaded that this deserves little attention, as it is probable that the power of the gastric fluid, and of the fermentation which happens in the stomach and intestines, reduces the whole nearly to an equality in respect of fluidity.

These are the observations I have to make with respect to ales in general; and with respect to the various conditions that ales may be in, I expect they will be readily understood from what we have said above on the differences of wines, as depending partly upon the difference of the fermentable subject, partly upon the different conduct of the fermentation, and especially upon the different period of fermentation at which the liquor is taken.

On the subject of drinks, it is proper for me to observe, that instead of fermented liquors, which have their qualities chiefly from the alcohol they contain, it has been common to separate the alcohol, and in its separate state to employ it in the composition of our drinks. It is often so employed by the addition of water alone; sometimes joining a little sugar, and sometimes joining both sugar and a portion of acid, for the most part the juice of lemons; and this composition makes the liquor named PUNCH. It is not necessary to prosecute this diversity here; for it is enough to our purpose to say, that alcohol separated from the fermented liquor in which it is produced, is always a more stimulant, inflammatory, and narcotic matter, than when it was blended with the other parts of the fermented liquor. The dilution of it with water alone may moderate these qualities, but not in any great degree; and the blending it with sugar, and the juices of fruits, may do it still more, but never entirely.

In these practices, it is common to employ the alcohol as it is diversified by the different fermented liquors from which it is drawn; and thus diversified, it may carry along with it certain oily matters,

which render it more agreeable to the palate, perhaps to the stomach, of particular persons: but I would maintain, that these different states of it in arrack, rum, brandy, or malt-spirit, do not differ from one another in the essential qualities of alcohol, and very rarely in their effects on the human constitution.

CHAPTER IV.

OF CONDIMENTS.

ALTHOUGH these are not properly alimentary matters, or become ingredients in the composition of the animal fluid, yet as they are taken in with the proper aliments, and modify the digestion and assimilation of these, they are porperly treated of in this place.

They are of two kinds, saline or acrid, having this acrimony for the most part residing in their oily parts. Of the first, the chief is sea-salt; and it is especially employed for preserving meat, before it is employed in diet for a longer time than it could be otherwise preserved from putrefaction.

For this purpose it must be applied in large proportion, and so incorporated with the substance of the meat, that it cannot be again washed out before the meat is employed in diet. It happens, therefore, that when salted meats are employed in that condition, the salt is often taken in in large quantity, and diffused in the mass of blood. If the salted meats, however, be taken in moderate quantity only, the salt has the effect of exciting the powers of digestion; and such meat is often more easily digested than entirely unsalted meats are.

But when salted meats are taken in large quantity, and make the greatest part of the diet, the salt increases greatly the saline state of the blood, and induces all the symptoms of scurvy. This indeed of late is a doctrine disputed: and it would not be proper for us to enter into the controversy here; but if it were, we are persuaded that our opinion could be well supported, and that the arguments on the other hand might be shown to be fallacious and false.

If it should be found that the serum of the blood in scorbutic persons proves antiseptic, as has been alleged, this may imply that such serum is in itself not putrid, and which indeed is not necessarily to be supposed in scurvy; but such serum cannot certainly

prove antiseptic, but by its containing a larger proportion than usual of saline matter. Nothing can appear to me more extraordinary than Dr LIND's assertion, that the serum of the blood in scorbutic persons is not anywise acrid to the taste;* for in numberless trials, I have never found the serum of the blood in the soundest persons without an acrimony discoverable by the taste: and if the saline efflorescence on the surface of the body, which Dr HULME takes notice of, be common, as I believe it is, in scorbutic persons, it is an irrefragable proof of the saline state of the blood in such persons.

Having thus mentioned the effects of a large proportion of sea-salt introduced into the body, it is, however, to be observed, that a certain quantity of it is necessary to the human œconomy. This appears from the desire of salt being an instinct universal in the human species, and from its being universally what gives relish to almost every kind of food. This relish of salt is an institution of nature, the efficient cause of which we cannot explain; but we presume very confidently, that it is adapted to serve some beneficial purpose in the œconomy, although we do not well understand either the cause or the purpose of this.

We can perceive very clearly that it proves a stimulus to the stomach, and may thereby promote its action, and therefore the digestion performed there; but this still does not sufficiently explain its being so constantly necessary. We might think of its antiseptic powers which might be useful in the human œconomy; but its poisonous quality in carnivorous animals,† and the utility

* And yet I am strongly inclined to believe Dr LIND's assertion; if, as I suppose, he means no more than to assert, that the blood in scorbutic cases, is not peculiarly acrid. I have not, indeed, had an opportunity of examining the blood of any person labouring under genuine scurvy. But I have, for several years, examined, with great care and attention, the blood of many persons, labouring under a variety of diseases, and especially all the forms of fever, including the malignant yellow fever. Though I have often found the serum very variable as to quantity and colour, in no instance have I ever perceived any peculiarly acrid taste in this portion of the blood. To me, its taste has been uniform: that of a mild saline fluid. Even in bilious fevers, and in jaundice itself, where the serum has been of a deep yellow colour, I have constantly found it destitute of bitterness, and only possessing its natural saline taste. I cannot place any great dependence upon Dr HULME's assertion, alluded to by Dr CULLEN.

† However it may be with *some* carnivorous animals, I am persuaded, from not a few observations, that there are *many* carnivorous animals, of various families and classes, to which salt is not a poison. On the contrary, the ani-

of it in the phytivorous, turns us off entirely from all our views of its antiseptic powers in the ordinary use of it. On the contrary, we might take up with the late sir John Pringle's opinion, that though in large quantity applied it is antiseptic, yet in small quantity it has contrary effects. This, however, is a doctrine not yet with me so well established that I can venture to apply it, or find that it will obviate the difficulties occuring upon this subject.

On this subject of saline condiments, it seems proper to observe, that nitre is frequently employed and joined with sea-salt as an antiseptic in preserving meat for some time before it is to be employed in diet. As nitre in every proportion is a powerful antiseptic, we have no doubt of its answering the purpose mentioned; but as it is commonly used in small proportion only, we believe that the particular effects of it in the human body are not to be perceived.

Another saline substance employed as a condiment, is sugar. The qualities of this as a nutritious matter we have spoken of above; and the qualities of it as a medicine we shall speak of hereafter. We have now to consider it as a condiment only; and in this view it is certainly antiseptic, and is therefore properly employed in preventing the putrefaction of animal substances.

It is also frequently applied to vegetables; but the preparation of boiling, which is commonly necessary in order to their being impregnated with the sugar, for the most part dissipates their volatile and active parts; so that such are the condita, except a few that contain a large proportion of a more fixed aromatic substance, that none of them can be considered as any thing else than a mass of sugar.

This is often applied to the acid and acescent fruits; and when applied in the consistence of a syrup, it preserves them for a long time from any fermentation, but it does not destroy their acescency; and when such Preserves are taken into the stomach, the sugar

mals, to which I allude, devour salt in considerable quantity. I believe, however, that it is a fact, that salt is much less necessary to the carnivorous than to the herbivorous animals. And it will always be found more necessary to the animals of new than to those of old countries. We see this fact strongly verified in North-America, where the animals (especially the *pecora*), both tame and wild, require much more salt in the newly cleared lands to the west than in those to the east of the mountains. The herbage of the latter, from long exposure to the sun, is less succulent than that of the former.

introduced along with them renders them much disposed to an acescent fermentation.

In the quantity that sugar is commonly employed, either for improving the relish of several kinds of food, or for correcting their acidity, it can only be hurtful by its acescency in the stomach, and can hardly make any proper part of the mass of blood. Although the experiments of the late ingenious Dr Stark are hardly dicesive on this subject, I am ready, however, to believe, that if it is taken in very large quantity, and in greater proportion than it can enter into the composition of the animal fluid, it may increase the saline state of the blood, and may induce various disorders.

Another saline condiment yet to be taken notice of is that of vinegar. It is a powerful antiseptic, and may be employed in several ways for preserving animal substances from putrefaction: and if we may believe what was said above with respect to acid in general, as entering into the composition of the animal fluid, we must consider vinegar as a vegetable acid that may be employed or thrown into the body with more safety than the fossil acids, though these are in experiments out of the body more powerful antiseptics. Animal food preserved by vinegar is hardly ever so much impregnated with it as to be rendered less digestible or less nutritious. It renders it only less putrescent; and therefore it is a condiment of animal food that is in every respect suited to the human constitution.

Vinegar is also employed in the preservation of vegetables from every fermentation, whether acescent or putrefactive. The vegetables so preserved are called Pickles; and a great variety of vegetables is employed in making such: but the boiling that is commonly required dissipates so much of the volatile and active parts that the peculiar qualities of the vegetable hardly ever remain; and almost the whole of our pickles may be considered as having no other quality but that of the vinegar they are impregnated with.

This is certainly, as other acids are, often useful in exciting the action of the stomach, and thereby promoting appetite and digestion; and if it be duly prepared by a very perfect fermentation, it will check rather than favour the acescency of vegetable matters in the stomach. This is an advantage which it has over the native acid of vegetables, which very often in the stomach runs into an acescent fermentation, and readily also excites it in other substances there.

It is, however, still to be remarked, that acids, and especially vegetable acids, although in a certain quantity they may excite the action of the stomach, yet in a larger quantity, and in certain stomachs, they prove truly refrigerant, and considerably weaken the tone of the stomach, so as thereby to prove hurtful in the gout and some other diseases.

These are the several condiments of the saline kind; and we have said that there is another kind taken from the vegetable kingdom, which I have put under the general title of Acrids, but which again may be divided into two kinds: the one, of aromatics imbued with peculiar and pretty strong odours: and the other, of more simple acrids imbued with little peculiar odour.

The aromatics are such substances as contain a large proportion of essential oil. They may be considered as especially of two kinds; those produced in the torrid zone containing an oil of greater specific gravity than water, but of some volatility, and at the same time acrid and inflammatory as applied to the sensible parts of our bodies.

The other aromatics are those afforded chiefly by the verticillated or umbelliferous plants of Europe. They are of less specific gravity, and of less acrimony, but of more volatility.

The whole of the essential oils are more or less antiseptic. Camphire, which I consider as of the number, is in this respect the most powerful; and the whole of the essential oils seem to have the same quality, as approaching to the nature of that. The camphire, however, as disagreeable both in taste and odour, is not, that I know of, employed as a condiment; while the others, from their agreeable odour, are the most frequently.

They are employed in two ways: first as antseptics, and joined with the saline matters above mentioned, for preserving meat from putrefaction before it is to be employed in diet; or, secondly, they enter into our sauces, and are taken in with our food, either to render these more grateful and sapid, or by the stimulus they give to the stomach to assist in digestion. One special purpose may be, that their volatile parts, by mixing with the air arising from the aliments, they may excite the action of the alimentary canal, and assist in the expulsion of the air distending it. With respect to this purpose, the qualities of the several aromatics will be taken notice of hereafter, when they are to be considered as medicines.

With respect to them as condiments, we have only to observe further, that in moderate quantity they may promote digestion, and

prove carminative, which shows that they are most properly employed with a vegetable diet: but as in large quantity they are stimulant and heating to the system, they are not necessary with animal food; and their frequent repetition renders an increase of their quantity constantly necessary, and thereby they certainly weaken the tone of the stomach.

Besides the aromatics, the acrid substances employed as condiments are especially taken from the class of tetradynamia, and they are chiefly the *mustard* and *horse-radish*. They are chiefly employed as taken in along with our food, and they certainly stimulate the stomach and assist digestion; and further, as they evidently promote perspiration and urine, they obviate the putrescent tendency of the system. This has been so much remarked, that the vegetables of this class, as fraught with this peculiar acrimony, are justly denominated Antiscorbutic. It will readily appear, that from the quality mentioned, these substances are as well suited to be used with our animal food as the aromatics are to be the proper condiments of our vegetable aliments.

Akin to the tetradynamia, and containing an acrimony nearly of the same quality, are the plants of the garlic tribe.

These of the milder kind, as the onion and leek, and especially when deprived of their acrimony, afford a great deal of nutritious matter; and so far as these, with the eschalot and others, are taken in as condiments, they are extremely safe and proper. The more acrid of this genus, as the garlic, is almost only employed as a condiment; and where the odour and taste can be admitted, it certainly stimulates the stomach very strongly, and promotes digestion. As promoting perspiration and urine, the whole of this order of plants are, with the tetradynamia, properly joined with our animal food, and justly also reckoned among the antiscorbutics.

Amongst the condiments, there is one sometimes employed which I cannot refer to any general head; but its odour, resembling in some degree that of the garlic I have been just now speaking of, minds me of it in this place. This is the *Asafœtida*, which in the countries producing it is of a less disagreeable odour, and much employed as a condiment; and to such persons of this country as can admit of its odour, it proves grateful to the taste and useful in promoting digestion.

Of the more simple acrids, the first that deserves to be mentioned is the *Capsicum*; which is without odour or particular taste, and is so readily diffusible that it joins agreeably and conveniently

with any other condiment or sauce. It seems to stimulate the stomach and promote digestion, and taken in largely is certainly amongst the most heating of the condiments.

These are the chief of the condiments; but they are seldom employed single, but variously combined to form a variety of sauces added in the kitchen or upon the table. What commonly makes the foundation of these, is what is called Ketchup. This is properly, in the first place, made of mushrooms, under a certain fermentation, probably putrefactive; and after it has undergone this, a variety of aromatics are added, as may be agreeable to the taste of particular persons. What the whole derives from the mushrooms, I cannot perceive; and think the ketchup, and many other compositions daily presented to the public, may all be considered as combinations of salt, vinegar, and aromatics: and from hence I think their qualities may be understood.

Another famous sauce and condiment is what is called Soy, which we have only as imported from the East Indies. By the best accounts I can find, it is a preparation from the seeds of a particular species of the *dolichos*. It appears to me to be prepared by a particular fermentation of the farina of this seed in a strong lixivium of common salt. Its taste is chiefly saline, with very little aroma; and its peculiar qualities, different from the other combinations mentioned, I cannot perceive.

I conclude this article of condiments with observing, that the whole of our seasonings consist of salt, vinegar, and aromatics, combined together: and if they are taken only in the quantity necessary to render the food more sapid, they may increase the appetite and favour full eating; but they can hardly otherwise do harm, unless when the aromatics are taken in such large quantity as to weaken the tone of the stomach in the manner we have mentioned above.

AFTER perusing what has now been said upon the subject of aliments, some of my readers may perhaps allege, that in marking the difference of aliments more nicety has been expressed than was necessary, as the most part of mankind do not either feel or perceive the effects of those differences of diet.

It is indeed true that the generality of mankind do not perceive the differences of diet very nicely; because man is of a nature suited to a great variety of functions, and therefore to a great va-

riety of states and circumstances, and among the rest to a great variety of aliments.

To this the human œconomy is particularly well suited; and the common saying of *Sanis omnia sana*, to a certain extent, is well founded; but this does not supercede all attention to the choice of aliments. Men are still of different constitutions with respect to their powers of digestion, nor less different with respect to the irritability of their system, and are consequently variously affected by the same aliments; and this so much as to have produced the vulgar observation, that *One man's meat is another man's poison.* This indeed does not apply in many cases, and only very remarkably in the case of the idiosyncrasies, which occur in some particular persons.

With respect to the most part of mankind, the different effects of aliment are not very remarkable; and though some excesses may take place, they are often transitory and unheeded: but it would be of consequence for men to know, that repetition may in time render these effects considerable and dangerous. It were well, therefore, that mankind were aware of the tendency which every kind of diet has to produce effects either immediately, or after repetition, unfavourable to health. It would, however, be difficult to give to the bulk of mankind the necessary instruction on this subject, and it would hardly be necessary to render it very universal, as it is not in many cases, and only in particular persons, that diseases arise from errors in diet; but it is absolutely necessary that physicians, who have the whole of mankind as objects of their attention, should study this matter; without which they cannot either perceive the causes of diseases, or direct the means of obviating them. In this business, however, I have often found physicians very deficient, from their great ignorance of the nature of aliments, and of the principles which should lead to the proper and necessary distinction of them. To supply this deficiency, and to give the necessary instruction, the foregoing treatise has been attempted; and though in some particulars it may be both imperfect and mistaken, I flatter myself that it gives the necessary principles more fully and justly than they had been given before, and at least points out the necessary speculations that must be entered into for ascertaining the nature of aliments more exactly. In all this I cannot have been too minute; and I cannot be of more service than by engaging physicians in a minute study of the subject.

CATALOGUS

Rerum specialium ex quibus constat Materia Medica.

Secundum ordinem Tabulæ præcedentis et quibus singulis apponuntur: 1mo, *Nomen Pharmaceuticum*, sive quo in Pharmacopœis publicis et in Pharmacopolarum officinis plerumque insignitur. 2do, *Nomen Botanicum*, sive Plantarum genericum et specificum triviale in Systemate Linneano nunc autem ad paginas Systematis Vegetabilis Linneani ab illustr. Andrea Murray, ann. 1784, editi relatum, ubi nomen specificum cum differentia specifica inveniri potest.* 3tio, *Nomen Anglicanum.*

PARS I. NUTRIMENTA.

Sectio I. Cibi.

1. Ex Vegetabilibus.

A Fructus.

a *Acido-dulces recentes.*

Drupaceæ.

Cerasus,
Prunus Cerasus, Syst. Veg. apud Murray, pag. 463,
Cherry.

Prunus,
Prunus domestica M. 463,
Plum.

Malum Armeniacum,
Prunus Armeniaca, M. 463,
Apricot.

Malum Persicum,
Amygdalus Persica M. 462,
Peach and Nectarine.

Pomaceæ.

Malum hortense,
Pyrus Malus, M. 466,
Apple.

Fructus.

Pyrus hortensis,
Pyrus communis, M. 466.
Pear.

Aurantium,
Citrus Aurantium, M. 697,
Seville orange,
China orange.

Limonium,
Citrus Medica, M. 697,
Lemon.

Senticosæ.

Fraga,
Fragaria vesca M. 476,
Strawberry.

Rubus idæus,
Rubus idæus M. 475,
Raspberry.

Ribesia.

Ribes rubrum,
Ribes rubrum M. 242,
Red currant.

* Interdum addidi nomina systematica botanicorum aliorum, ut Aiton (*Ait.*), Michaux (*Mich.*), Willdenow (*Willd.*), &c.

Fructus.

Ribesia.

Ribes nigrum,
Ribes nigrum M. 243.
Black currant.

Grossularia,
Ribes Grossularia M. 243,
Gooseberry.

*Vaccinia varia, viz.
*Vaccinium corymbosum M. 363,
*Vaccinium resinosum, *Ait.*
*Vaccinium myrtilloides, *Mich.*
*Whortle-berries, Huckle-berries.
*Vaccinium macrocarpon, *Ait.*
*American Craneberry, or Cramberry,

Uvæ vitis,
Vitis vinifera M. 244,
Grapes.

b. *Acido-dulces siccatæ.*

Uvæ passæ majores,
Vitis vinifera M. 244.
Raisins.

Uvæ passæ minores,
Vitis vinifera apyrena Linn. spec. plant. var. β p. 293,
Dried currants.

*Diospyros,
*Diospyros virginiana M. 918,
*Persimmon, Pishamin.

Caricæ,
Ficus Carica M. 921,
Fig.

Dactyli,
Phœnix dactylifera M. 985,
Date.

c. *Cucurbitaceæ.*

Cucumis,
Cucumis sativus M. 869,
Cucumber.

Fructus.

Cucurbitaceæ.

Melo,
Cucumis Melo M. 869,
Melon.

*Cucurbita,
*Cucurbita Citrullus M. 869,
*Water-melon.

B. Herbæ Oleraceæ.

Atriplex,
Atriplex hortensis M 909,
Orache.

Beta,
Beta vulgaris M. 262,
Beet.

Spinacia,
Spinacia oleracea M. 886,
Spinage.

Valerianella,
Valeriana locusta M. 80.
Lamb lettuce.

Siliquosæ.

Brassica,
Brassica oleracea M. 601,
Colewort and cabbage.

Nasturtium hortense,
Lepidium sativum M. 586,
Garden cress.

Nasturtium aquaticum,
Sisymbrium Nasturtium M. 594.
Water cress.

Semiflosculosæ.

Cichorium,
Cichorium Intybus M. 722,
Succory.

Endivia,
Cichorium Endivia M. 722,
Endive.

Dens leonis,
Leontodon Taraxacum M. 715,
Dandelion.

Herbæ Oleraceæ.

Semiflosculosæ.

Lactuca,
Lactuca sativa M. 713,
Lettuce.

Umbellatæ.

Celeri,
Apium graveolens M. 292,
Celery.

Petroselinum,
Apium Petroselinum M. 292
Parsley.

Capitatæ.

Cinara,
Cynara Scolymus M. 728,
Artichoke.

Asparagus,
Asparagus officinalis M. 332,
Asparagus.

*Polygonatum,
*Convallaria Polygonatum M. 334,
*Solomon's-seal, Wild asparagus.

*Phytolacca,
*Phytolacca decandra M. 438,
*American Night-shade, Poke, Garget.

*Asclepias,
*Asclepias syriaca M. 259,
*Milkweed.

C. Radices.

Siliquosæ.

Raphanus,
Raphanus sativus M. 603,
Radish.

Rapum,
Brassica Rapa M. 601,
Turnip.

Umbellatæ.

Daucus,
Daucus Carota M. 277,

Radices.

Umbellatæ.

Carrot.

Pastinaca,
Pastinaca sativa M. 290,
Parsnip.

Sisarum,
Sium Sisarum M. 284,
Skirret.

Semiflosculosæ.

Scorzonera,
Scorzonera Hispanica M. 711,
Viper's grass.

Tragopogon,
Tragopogon porrifolium M. 710,
Salsafi.

Alliaceæ.

Allium,
Allium sativum M. 322,
Garlic.

Porrum,
Allium porrum M. 321,
Leek.

Cepa,
Allium Cepa M. 323,
Onion.

Cepa ascalonica
Allium ascalonicum M. 323,
Shallot.

Scorodoprasum,
Allium Scorodoprasum M. 322,
Roccambole.

Farinosæ.

Batatas,
Solanum tuberosum M. 224,
Potatoes.

*Batatas,
*Convolvulus Batatas M. 201,
*Sweet potatoe, Long potatoe.

Radices.

Farinosæ.

Salep,
Orchis Morio M. 808,
Salep.

*Tucca,
*Tuber Tucca, B. *vel Editoris.*
*Tuckahoe, Deer Turnip.

D. SEMINA.

Cerealia.

Hordeum,
Hordeum vulgare M. 125,
Barley.

Avena,
Avena sativa M. 122,
Oat.

Secale,
Secale cereale M. 125,
Rye.

Milium,
Panicum miliaceum M. 106,
Millet.

Triticum,
Triticum hybernum M. 126,
Wheat.

Oryza,
Oryza sativa M. 345,
Rice.

*Zizania,
*Zizania palustris M. 855,
*Wild rice, wild oats.

Maiz,
Zea Mays M. 841,
Maize.

Cerealibus affinia.

Sago,
Cycas circinalis M. 925,
Sago.

Fagopyrum,
Polygonum Fagopyrum M. 379,
Buck wheat.

Semina.

Cerealibus affinia.

Castanea,
Fagus Castanea M. 859,
Chesnut.

*Castanea Americana, B. *vel Editoris.*
*American Chesnut.
*Castanea Chinquepin, B. *vel Editoris.*
**Est Fagus pumila* M. 859.
*Dwarf Chesnut, Chinquepin.

*Quercus,
*Quercus virens, *Willd.*
*Live Oak.

Legumina.

Pisum,
Pisum sativum M. 660,
Pea.

Faba,
Vicia Faba M. 665,
Bean.

Phaseolus,
Phaseolus vulgaris M. 656,
Kidney bean.

*Arachis,
*Arachis hypogæa M. 655.
*Ground-nut, Earth-bean.

Nuces oleosæ.

Amygdalus,
Amygdalus communis M. 462,
Variat dulcis,
amara,
Sweet almonds,
Bitter slmonds.

Avellana,
Corylus Avellana M. 859,
Filbert.

Cacao,
Theobroma Cacao M. 696,
Chocolate.

Juglans,
Juglans regia M. 858,

Semina.

Nuces oleosæ.

Walnut.

*Juglans,
*Juglans nigra M. 859,
*Black walnut.

*Juglans,
*Juglans cinerea M. 859,
*Butter-nut.

*Juglans,
*Juglans olivæformis, *Mich.*
*Pecan-nut, Pecanos.

*Juglans,
*Juglans tomentosa, *Mich.*
*Shell-bark Hickory.

Pistachio,
Pistacia vera M. 884,
Pistachio nut.

*Helianthus,
*Helianthus annuus M. 781,
*Sun-flower, great annual Sun-flower.

Sepiariæ.

Olivæ,
Olea Europæa M. 57,
Olives.

E. Fungi.

Agaricus campestris M. 975,
Common esculent mushroom.

Phallus esculentus M. 978,
Morell.

Lycoperdon tuber M. 981,
Truffle.

Sectio II. Potus.

Aqua et aquosa.
Potus fermentati.
Cerevisia.
Vinum.

Sectio III. Condimenta et Condita.

Aromata et acria.
Saccharo, sale, vel aceto Condita.

II. Ex Animalibus.†

A. Quadrupedia.

a *Lac:*

Fœminæ,
Asinæ,
Equæ,
Vaccæ,
Capræ,
Ovis.

b. *Carnes.*

Pecora.

Bos,
Bos Taurus Linn. Syst. Nat. 98,
The ox.

Ovis,
Ovis Aries L. 97,
The sheep.

Caper,
Capra Hircus L. 94,
The goat.

Cervus,
Cervus Elaphus L. 93,
The hart, stag, or red deer.

Cervus,
Cervus Dama L. 93,
Buck or fallow deer.

Cervus,
Cervus Capreolus L. 94,
Roebuck.

*Cervus,
*Cervus Wapiti, B. *vel Editoris.*
*Elk, Round-horned Elk.

Glires.

Lepus,

† Animalium nomina systematica ad Linnæi Systema Naturæ anno 1766 editum ubique referuntur. C.——Addidi nomina systematica aliorum.

Carnes.

Glires.

Lepus timidus L. 77,
The hare.

Cuniculus,
Lepus Cuniculus L. 77,
The rabbit.

*Lepus,
*Lepus americanus, *Gmel.*
*Lepus Whapus, B. *vel Editoris.*
*Common Rabbit of North-America, wild Rabbit.

Belluæ.

Sus,
Sus Scrofa L. 102,
The hog.

B. Aves.

Gallinæ.

Gallus,
Phasianus Gallus L. 270,
Dunghill fowl.

Phasianus,
Phasianus colchicus L. 271,
Pheasant.

Gallo Pavo,
Meleagris Gallo pavo L. 268,
Turkey.

Pavo,
Pavo cristatus L. 267,
Peacock.

Meleagris,
Numida Meleagris L. 273,
Guiney hen.

Perdix,
Tetrao Perdix L. 276,
Partridge.

Coturnix,
Tetrao Coturnix L. 278,
Quail.

Lagopus,
Tetrao Lagopus L. 274,
Ptarmigan.

Aves.

Gallinæ.

Tetrao rusescens,
Bonasa Scotica Brisson. Ornith. p. 199.
Scotis, Moorfowl,
Anglis, Redgame or Grouse.

Tetrix,
Tetrao Tetrix, L. 274,
Black cock, or black game.

Urogallus,
Tetrao Urogallus L. 273,
Cock of the mountain.

*Tetrao,
*Tetrao umbellus L. 275,
*Grouse, Heath-hen.

*Tetrao,
*Tetrao cupido L. 274,
*Pheasant, Partridge.

*Tetrao,
*Tetrao virginianus L. 277,
*Partridge, Quail.

Anseres.

Anas domestica,
Anas Boschas L. 205,
Common duck.

Querquedula,
Anas Crecca L. 204,
Teal.

Anser domesticus et ferus,
Anas Anser L. 197,
Tame and wild goose.

Anser Bassanus,
Pelicanus Bassanus L. 217,
Solan goose.

*Anas,
*Anas ferina L. 203,
*Canvas-Back.

Alca,
Alca Torda L. 210,
Razorbill or marrot.

Larus,
Larus tridactylus L. 224,
Kittiwake.

Aves.

Grallæ.

Scolopax,
Scolopax rusticola L. 243,
Woodcock.

Gallinago minor,
Scolopax Gallinago L. 244,
Snipe.

Arquata,
Scolopax Arquata L. 242,
Curlew.

Tringa,
Tringa Squatarola L. 252,
Grey plover.

Charadrius,
Charadrius pluvialis L. 254,
Green plover.

*Charadrius,
*Charadrius vociferus L. 253,
*Chattering Plover, Kildee, Kildeer.

Rallus,
Rallus Crex L. 261,
Land rail.

*Rallus,
*Rallus carolinus L. 262,
*Rail, Soree, Sorus.

Passeres.

Columba,
Columba Oenas L. 279,
Pigeon.

*Columba,
*Columba migratoria L. 285,
*Passenger Pigeon, Wild Pigeon.

Alauda,
Alauda arve nsisL. 287,
Lark.

*Alauda,
*Alauda magna† L. 289,
*Lark, Meadow lark.

Aves.

Passeres.

*Emberiza,
*Emberiza Hortulana L. 309,
*Ortolan.

*Emberiza,
*Emberiza oryzivora L. 314,
*Rice-bird, Reed-bird, Barley-bird.—*Caro gratissima.*

*Turdus,
*Turdus migratorius L. 292,
*Robin.—*Caro grata.*

*Caprimulgus,
*Caprimulgus religiosa, B. *vel Editoris.*
*American goat-sucker, Whippoorwill.

Volucrum ova.

C. Amphibia.

Amphibia reptilia.

Testudo,
Testudo Mydas L. 350,
Tortoise.

*Testudo,
*Testudo ferox, *Gmel.*
*Soft-shell Tortoise.

*Testudo,
*Testudo concentrica, *Shaw.*
*Terrapin, Tarrapin .—*Caro et ova fere omnibus grata.*

Rana,
Rana esculenta L. 357,
Frog.

Amphibia serpentia.

Vipera,
Coluber berus L. 377,
Viper or adder.

*Crotalus,
*Crotalus horridus L. 372,
*Rattle-snake.

† Non generis alaudæ est, sed potius Sturni. Caro non insapida, sed sæpe, animalculis infesta, macra.

Amphibia.

Amphibia nantia.

Batis,
Raia Batis L. 395,
Skate.

Clavata,
Raia clavata L. 397,
The Thornback.

D. Pisces.

Anguilla,
Muræna Anguilla L. 426,
Eel.

Anarhichas,
Anarhichas Lupus L. 430,
Wolf-fish or cat-fish.

Gadus,
Gadus Morhua L. 436,
Cod.

Gadus Æglefinus L. 435,
Haddoc.

Gadus Merlangus L. 438,
Whiting,

Faber,
Zeus Faber L. 454,
The doree.

Pleuronectes,
Pleuronectes Rhombus L. 458,
Turbot.

Pleuronectes Solea L. 457,
The sole.

Pleuronectes Flesus L. 457,
Grey flounder.

Perca,
Perca fluviatilis L. 481,
Perch.

Scomber,
Scomber Scomber L. 492,
Mackrel.

Pisces.

Salmo,
Salmo Salar L. 509,
Salmon.

Esox Lucius L. 516,
The pike.

*Clupea Alosa L. 523,
*Shad.

Clupea Harengus L. 522,
Herring.

Clupea Encrasicolus L. 523,
Anchovy.

Cyprinus Carpio L. 525,
Carp.

Cyprinus Trinca L. 526,
Tench.

E. Insecta.

Cancer,
Cancer Paguras L. 1044,
Common crab.

Cancer Gammarus L. 1050,
The lobster.

Cancer Astacus L. 1051,
The Crayfish.

Cancer Squilla L. 1051,
The prawn.

F. Vermes.

Pectunculus vulgaris,
Cardium edule L. 1124,
Cockle.

Ostrea,
Ostrea edulis L. 1148,
Common oyster.

Mytilus,
Mytilus edulis L. 1157,
Common muscle.

PARS II. MEDICAMENTA.

I. Adstringentia.

A. Ex Fossilibus.

Bolus,
Argilla,
Bole.

Creta,
Calx Creta,
Chalk.

Alumen,
Alumen commune schisti,
Alum.

Metallica.
Ex Ferro:
Hæmatites,
Rubigo,
Vitriolum viride.
Ex Cupro:
Ærugo,
Vitriolum cæruleum.
*Ex Argento:
*Causticum lunare,
*Argentum nitratum.
Ex Plumbo:
Cerussa,
Saccharum saturni,
Lithargyrus,
Minium.
Ex Zinco:
Calaminaris,
Tutia,
Vitriolum album.
*Ex Vismutho:
*Oxydum Vismuthi,
*White oxide of Bismuth.
*Ex Arsenico:
*Oxidum Arsenici, *sive*
*Arsenious acid.

B. Ex Vegetabilibus.

a *Senticosæ.*
Agrimonia,
Agrimonia Eupatoria M. 447,
Agrimony,

Ex Vegetabilibus.

Senticosæ.

Alchemilla,
Alchemilla vulgaris M. 166,
Ladies mantle.

Argentina,
Potentilla Anserina M. 477,
Silver weed.

Caryophyllata,
Geum urbanum M. 480,
Avens.

Fragaria,
Fragaria vesca M. 476,
Strawberry.

Rosa rubra,
Rosa Gallica M. 474,
The red rose.

Quinquefolium,
Pentaphyllum,
Potentilla reptans M. 479,
Cinquefoil.

Tormentilla,
Tormentilla erecta M. 479,
Tormentil.

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*Heuchera Americana M 266,
*American Sanicle, *sive*
*Alum-root.
**Radix valde adstringens est.*

*Geranium,
*Geranium maculatum M. 617,
*Spotted Geranium, *sive*
*Tormentil.
**Radix et folia potenter adstringunt.*

*De viribus Heucheræ Americanæ et Geranii maculati, *Vide* Collections &c. parts First and Second.

Ex Vegetabilibus.

b. *Stellatæ.*

Aparine,
Galium Aparine M. 151,
Goose Grass.

Galium,
Galium verum M. 150,
Ladies bedstraw.

Rubia,
Rubia tinctorum M. 152,
Madder.

c. *Vaginales.*

Acetosa,
Rumex Acetosa M. 348,
Sorrel.

Hydrolapathum,
Rumex aquaticus M. 347,
Great water-dock.

Oxylapathum,
Rumex acutus M. 346,
Sharp-pointed dock.

Bistorta,
Polygonum Bistorta M. 376,
Greater bistort.

Rhabarbarum monachorum,
Rumex alpinus M. 347,
Monks rhubarb.

Rhaponticum,
Rheum Rhaponticum M 385
Rhapontic.

d. *Cryptogamiæ.*

Filix florida,
Osmunda regalis M. 927,
Flowering fern.

Lingua cervina,
Asplenium Scolopendrium M. 932,
Harts-tongue.

Trichomanes,
Asplenium Trichomanes M. 941,
Maidenhair.

Filix,

Ex Vegetabilibus.

Cryptogamiæ.

Polypodium Filix mas M. 937,
Male fern.

Equisetum,
Equisetum hyemale M. 925,
Horse tail.

Muscus pyxidatus,
Lichen pyxidatus M. 963,
Cup-moss.

e. *Cortices.*

Malicorium,
Punica Granatum M. 462,
Pomegranate rind.

Fraxini,
Fraxinus excelsior M. 918,
Ash bark.

Querci,
Quercus Robur M. 858,
Oak bark.

*Quercus alba M. 858,
*White oak.

*Quercus Prinus M. 858,
*Chesnut oak.

*Quercus tinctoria *Bartram*, & *Mich.*
*Die oak, Black oak.

Lignum Campechense,
Hæmatoxylum Campechianum M. 398,
Logwood.

Gallæ,
Quercus Cerris M. 858,
Galls.

f. *Fructus acerbi.*

Cydonia,
Pyrus Cydonia M. 467,
Quinces.

Mespila,
Mespilus Germanica M. 466
Medlars.

Ex Vegetabilibus.

Fructus acerbi.

*Mespilus arbutifolia M. 466,
*Medlar, Choak-cherry.

Mora,
Morus nigra M. 851,
Mulberries.

Pruna Silvestria,
Prunus spinosa M. 463,
Sloes.

Sorba,
Sorbus domestica M. 465,
Wild service berries.

*Diospyros,
*Diospyros virginiana M.918,
*Persimmon, Pishamin. *Vide* vol. i. p. 155, 280.
**Fructus adhuc gelu intactus, acerbissimus est.*

g. *Succi inspissati.*

Acacia,
Mimosa Nilotica M. 917,
Acacia.

Terra Japonica,
Mimosa Catechu M. 916,
Japan earth.

Sanguis Draconis,
Pterocarpus Draco M. 641,
Dragon's blood.

Kino,
Gummi rubrum astringens,
Kino.

h. *Adstringentia varia ad certa capita non referenda.*

Anchusa,
Anchusa tinctoria M. 186,
Alkanet.

Balaustia,
Punica Granatum M. 462,
Balaustines.

Hypericum,
Hypericum perforatum M. 701,
St John's wort.

Ex Vegetabilibus.

Adstringentia varia.

Salicaria,
Lythrum Salicaria M. 446,
Loose strife.

Millefolium,
Achillea Millefolium, M. 773,
Milfoil or yarrow.

Myrtus,
Myrtus communis M. 461,
Myrtle.

Plantago,
Plantago major M. 155,
Plantain.

Polygonatum,
Convallaria Polygonatum M. 334,
Solomon's seal.

Viscus quernus,
Viscum album M. 883,
Misletoe.

Uva Ursi,
Arbutus Uva Ursi M. 408,
Bear's berry.

II. Tonica.

Gentiana,
Gentiana lutea M. 267,
Gentian.

Cursuta,
Gentiana purpurea M. 267,
Cursuta.

Centaureum minus,
Gentiana Centaureum M. 268,
Lesser centaury.

*Gentiana linearis, *Froelich de Gentiana*, p. 37, 38,
*Narrow-leaved Gentian, Cholic-root.
*Habitat in America *Septentrionali.*

Tonica.

**Radix lutea, et valde amara. Ni fallor, quoque subnarcotica est.*

*Chironia,
*Chironia angularis M. 229,
*Centaury; Centry *vulgo.*

*Frasera,
*Frasera officinalis B. *vel Editoris.*
*Frasera Walteri *Mich.*
*Columbo, *et* Columbia *vulgo.*

Quassia,
Quassia amara M. 401,
Quassy.

Simarouba,
Quassia Simarouba M. 401,
Simarouba.

Trifolium palustre,
Menyanthes trifoliata M. 194,
Marsh trefoil or buck bean.

Faba St Ignatii,
Ignatia amara M. 227,
Jesuit's bean.

Fumaria,
Fumaria officinalis M. 637,
Common fumitory.

*Columbo,
*Menispermum?

Chamamælum,
Anthemis nobilis M. 776,
Chamomile.

*Zanthorhiza,
*Zanthorhiza apiifolia *Herit.*
*Yellow-Root, Parsley-leaved Yellow-root.
* *Vide* Collections &c.

*Helleborus,
*Helleborus trifolius M. 519,
*Three-leaved Hellebore; *vulgo* Golden Thread, et Throat-root.

*Hydrastis,
*Hydrastis amara B. *vel Editoris.*

Est

Tonica.

*Hydrastis canadensis M. 519.
*Yellow-root.
* *Radix usurpatur.*

Tanacetum,
Tanacetum vulgare M. 742,
Tansey.

Absynthium,
Artemisia Absynthium M. 744,
Wormwood.

Abrotanum,
Artemisia Abrotanum M. 743,
Southernwood.

Lupulus,
Humulus Lupulus M. 886,
Hops.

Scordium,
Teucrium Scordium M. 527,
Water germander.

Serpentaria Virginiana,
Aristolochia Serpentaria M. 824,
Virginian snake-root.

*Aurantium,
*Citrus aurantium M. 697,
*Orange.

*Aurantium,
*Citrus medica M. 697,
*Lemon.

Arnica,
Arnica montana M. 768,
Leopard's bane.

*Angustura,
*Cusparia febrifuga? *Humboldt* & *Bompland.*
*Angustura-bark.

*Magnolia,
*Magnolia acuminata M. 508,
*American Cucumber-tree.

*Magnolia,
*Magnolia tripetala M. 508,
*Umbella-tree, Big leaf, Indian-bark.

Tonica.

*Tulipifera,
*Liriodendron Tulipifera M. 507,
*Tulip-tree, Poplar &c.
*Magnolia,
*Magnolia glauca M. 508,
*Common Magnolia, Swamp-Sassafras, Beaver-tree, laurel.

Cortex Peruvianus,
Chinchona officinalis M. 213,
*Cinchona lancifolia *Mutis.*
Peruvian bark.
*Pale-bark.

*Cinchona oblongifolia *Mutis.*
*Red-bark.

*Cinchona cordifolia *Mutis.*
*Yellow-bark.

*Salix,
*Salicis variæ species, ut S. latifolia. S. pentandra, &c., &c.

*Cornus,
*Cornus florida M. 159,
*Common American Dog-wood, New-England Box-wood, &c.

*Cornus,
*Cornus sericea M. 159,
*Swamp Dogwood, Red-Willow, Rose-Willow, &c.

III. Emollientia.

Aqua.
Aqua cum farinosis vel mucilaginosis infusa vel decocta.

1. Ex Vegetabilibus.

a. *Columniferæ.*

Althæa,
Althæa officinalis M. 624,
Marsh mallow.

Ex Vegetalibus.

Columniferæ.
Malva,
Malva Silvestris M. 625,
Mallow

*Hibiscus,
*Hibiscus esculentus M. 630,
*Okra.
**Hujus spec. capsulæ aquâ coctæ, valde mucilaginosæ evadunt, et alimentum multis gratum, omnibus nutrativum, præbent.*

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*Tilia,
*Tilia americana M. 493,
*American Lime, or Linden-tree. Bass-wood, Butter-wood.
**Cortex interior quantitatem mucilaginis delicat. largam præbet. In artibus, pro alimento, et in medicina (in combustionibus) usurpatur.*

b. *Farinosa vel mucilaginosa.*

Cannabis semina,
Cannabis sativa M. 886,
Hemp seed.

Cydoniorum semina,
Pyrus Cydonia M. 467,
Quince seed.

Fœnugræci semina,
Trigonella Monspeliensis M. 692,
Fenugreek seed.

Lini semina,
Linum usitatissimum M. 302,
Linseed.

Psyllii semina,
Plantago Psyllium M. 156,
Fleawort seed.

c. *Oleraceæ.*

Atriplex,

Ex Vegetabilibus.

Oleraceæ.

Atriplex hortensis M. 909,
Orache.

Beta,
Beta vulgaris M. 262,
White and red beet.

Bonus Henricus,
Chenopodium Bonus Henricus M. 261,
English mercury.

Spinacia,
Spinacia oleracea M. 886,
Spinage.

d. *Emollientia varia.*

Alsine,
Alsine media M. 298,
Chickweed.

Branca ursina,
Acanthus mollis M. 580,
Bears breech.

Melilotus,
Trifolium Melilotus M. 687,
Melilot.

Parietaria,
Parietaria officinalis M. 908,
Pellitory of the wall.

Saponaria,
Saponaria officinalis M. 416,
Soapwort.

Verbascum,
Verbascum Thapsus M. 219,
Mullein.

Radix liliorum alborum,
Lilium candidum M. 324,
White lily.

Cepæ coctæ,
Allium Cepa M. 323,
Onion.

e. *Oleosa.*

Olea expressa blanda.

3. Ex Animalibus.

Lac,

Ex Animalibus.

Butyrum,
Adeps,
Axungia.

*Axungia Crotali spec. var. *multum apud Americanos, præsertim rudiores vel sylvanos, laudatur.*

Spermaceti,
Physeter macrocephalus L. 107,
Spermaceti.

IV. Erodentia sive Corrosiva.

Acidum concentratum,
Vitriolicum,
Nitrosum.

Causticum commune acerrimum,
Lixivium causticum inspissatum Ph. Ed.
Strong caustic.

Causticum commune mitius,
Lixivium Causticum cum calce viva Ph. Ed.
Common caustic.

Causticum commune fortius,
Calx cum Kali puro Ph. Lond.
Strong London caustic.

Causticum Lunare,
Acidum nitrosum argento junctum,
Lunar caustic.

Vitriolum cæruleum,
Acidum vitriolicum cupro junctum,
Blue vitriol.

Ærugo,
Acidum vegetabile cupro junctum,
Verdigrise.

Butyrum antimonii,
Acidum muriaticum antimonis junctum,

Ærodentia sive Corrosiva.

Butter of antimony.

Hydrargyrus acidis variis junctus,
Preparations of quicksilver.

Arsenicum album,
Arsenicum nudum L. S. N. 107,
Arsenic.

V. Stimulantia.

A. Verticillatæ.

Betonica,
Betonica officinalis M. 535,
Betony.

Lavendula,
Lavendula Spica M. 530,
Lavender.

Melissa,
Melissa officinalis M. 542,
Baum.

Majorana,
Origanum Majorana M. 541,
Sweet marjoram.

Origanum,
Origanum vulgare M. 541,
Wild marjoram.

Marum,
Origanum Syriacum M. 541,
Syrian herb mastich.

Rosmarinus,
Rosmarinus officinalis M. 68,
Rosemary.

Hyssopus,
Hyssopus officinalis M. 529,
Hyssop.

Hedera terrestris,
Glechoma hederacea M. 534
Ground ivy.

Mentha,
Mentha viridis M. 532,
Mentha spicata Hudsoni Flora Anglica,
Spearmint.

Stimulantia.

Verticillatæ.

Mentha piperita,
Mentha piperita M. 532,
Peppermint.

Pulegium,
Mentha Pulegium M. 533,
Pennyroyal.

*Cunila,
*Cunila mariana M. 67,
*American Dittany.

*Cunila,
*Cunila pulegioides M. 67,
*(Hedeoma pulegioides *Persoon*, 2. 131,)
*American pennyroyal.

*Monarda,
*Monarda punctata M. 68,
*(Monarda lutea *Mich.*)
*Horse-mint, Pot-marjoram, &c.

Satureia,
Satureia hortensis M. 528,
Savoury.

Thymus,
Thymus vulgaris M. 542,
Thyme.

Serpyllum,
Thymus Serpyllum M. 541,
Mother of thyme.

Salvia,
Salvia officinalis M. 68,
Sage.

B Umbellatæ.

Anethum,
Anethum graveolens M. 290,
Dill.

Angelica,
Angelica Archangelica M. 284,
Garden angelica.

Anisum,
Pimpinella Anisum M. 291,
Anise.

Stimulantia.

Umbellatæ.

Carum,
Carum Carvi M. 291,
Caraway.

Coriandrum,
Coriandrum sativum M. 287,
Coriander.

Cuminum,
Cuminum Cyminum M. 285,
Cummin.

Fœniculum,
Anethum Fœniculum M. 291,
Sweet fennel.

Pimpinella,
Pimpinella saxifraga M. 291,
Burnet saxifrage.

*Panax,
*Panax quinquefolium M. 920,
*Common Ginseng.

*Panax,
*Panax minor B. *vel Editoris*,
*(Panax trifolium M. 920,)
*Lesser Ginseng, three leaved Ginseng.

C. Siliquosæ.

Cochlearia,
Cochlearia officinalis M. 588,
Scurvy-grass.

Erysimum,
Erysimum officinale M. 596,
Hedge mustard.

Nasturtium,
Sisymbrium Nasturtium M. 594,
Water cresses.

Raphanus rusticanus,
Cochlearia Armoracia M. 588,
Horse radish.

Sinapi,
Sinapis nigra M. 602,
Mustard.

Stimulantia.

D. Alliaceæ.

Allium,
Allium sativum M. 322,
Garlic.

Cepa,
Allium Cepa M. 323,
Onion.

Porrum,
Allium Porrum M. 321,
Leek.

E. Coniferæ.

Abies,
Pinus Abies M. 861,
Scotch fir.

Pinus,
Pinus Silvestris M. 860,
Pine.

Juniperus,
Juniperus communis M. 894,
Juniper.

*Juniperus,
*Juniperus virginiana M. 884,
*Virginian Juniper, Red-cedar.

F. Balsamica.

Terebinthina Veneta,
Pinus Larix M. 860,
Venice turpentine.

Terebinthina communis,
Pinus Silvestris M. 860,
Common turpentine.

Balsamum Canadense,
Pinus Balsamea M. 860,
Canada Balsam.

Balsamum Copaibæ,
Copaifera officinalis M. 409,
Balsam of Copaiba or Capivi.

Balsamum Peruvianum,
Myroxylon Peruiferum M. 395,
Peruvian balsam, or balsam of Peru.

Stimulantia.

Balsamica.

Balsamum Tolutanum,
Toluifera balsamum M. 398,
Balsam of Tolu.

G. Resinosa.

Guaiacum,
Guaiacum officinale M. 396,
Gum guaiacum.

Myrrha,
Myrrha,
Myrrh.

Ladanum,
Cistus Creticus M. 497,
Labdanum.

Styrax calamita,
Styrax officinale M. 409,
Storax.

Styrax liquida,
Liquidambar Styraciflua M. 860,
Liquid storax.

Benzoinum,
Croton Benzoe M. 863,
Benjamin.

H. Aromatica.

Cinnamomum,
Laurus Cinnamomum M. 383,
Cinnamon.

Cassia lignea,
Laurus Cassia M. 383,
Cassia bark.

Nux Moschata,
Myristica Moschata M. 493,
Nutmeg.

Macis,
Myristica Moschata M. 493,
Mace.

Caryophillus,
Caryophillus aromaticus M. 496.

Stimulantia.

Aromatica.

Cloves.

Pimento,
Myrtus Pimenta M. 462,
Jamaica pepper or All-spice,

Canella alba,
Canella alba M. 443,
Wild cinnamon.

Cortex Winteranus,
Wintera aromatica M. 507,
Winter's bark.

Cascarilla,
Croton Cascarilla M. 863,
Cascarilla.

Piper,
Piper nigrum M. 74,
Black pepper.

Capsicum,
Capsicum annuum M. 226,
Guiney pepper.

Zingiber,
Amomum Gingiber M. 50,
Ginger.

Cubebæ,
Piper Cubeba sive Caudatum M. 74,
Cubebs.

Cardamomum minus,
Amomum Cardamomum M. 50,
Cardamom.

Zedoaria,
Kaempferia rotunda M. 51,
Zedoary.

Serpentaria Virginiana,
Aristolochia Serpentaria M. 824,
Virginian snake-root.

Ginseng,
Panax quinquefolium M. 920,
Ginseng.

Stimulantia.

Aromatica.

Acorus verus,
Acorus Calamus M. 339,
Sweet-scented flag.

I. Acria.

Arum,
Arum maculatum M. 828,
Cuckow pint.

*Arum,
*Arum triphyllum M. 827,
*Three-leaved Cuckow-pint, Indian turnip.

Persicaria urens,
Polygonum Hydropiper M. 377,
Water-pepper or arsmart.

Pyrethrum,
Anthemis Pyrethrum M. 776,
Pellitory of Spain.

Staphisagria,
Delphinium Staphisagria M. 503,
Staves acre.

*Clematis,
*Clematis sericea *Mich.—et aliæ species.*
*Virgins-bower.

Sedantia.

VI. Narcotica.

a. *Rhæades.*

Papaver,
Papaver somniferum M. 490
White poppy.

*Sanguinaria,
*Sanguinaria canadensis M. 489,
*Puccoon, Indian paint, Turmeric.
**Semina narcotica: radix emetica. Planta non spernenda.*

Sedantia.

Narcotica.

b. *Umbellatæ.*

Cicuta,
Conium maculatum M. 278,
Hemlock.

Cicuta aquatica,
Cicuta virosa M. 286,
Water hemlock.

c. *Solanaceæ.*

Belladonna,
Atropa Belladonna M. 221,
Deadly night-shade.

Hyoscyamus,
Hyoscyamus niger M. 220,
Henbane.

Nicotiana,
Nicotiana Tabacum M. 221,
Tobacco.

Solanum,
Solanum nigrum M. 224,
Night-shade.
*Digitalis.

Stramonium,
Datura Stramonium M. 220,
Thorn apple.

d. *Variæ.*

Lactuca virosa,
Lactuca virosa M. 713,
Strong-scented lettuce.

Lauro Cerasus,
Prunus Lauro-Cerasus M. 462,
Cherry bay.

Laurus,
Laurus nobilis M. 383,
Bay.

Camphora,
Laurus Camphora M. 383,
Camphire.

Thea,
Thea Bohea M. 495,

Sedantia.

Narcotica.

Thea viridis M. 496,
Bohea and green tea.
Crocus,
Crocus sativus M. 83,
Saffron.

Nymphæa,
Nymphæa alba M. 491,
Nymphæa lutea M. 491,
Water lily.

e. Vinum.

Alcohol.

VII. Refrigerantia.

Acida quæcunque diluta,
Sales nutri ex acido quovis præter muriatico cum alkali quovis juncto,
Sal terrestris ex acido cum terra alkalina juncto,
Sal metallicus ex acido cum plumbo juncto,
Aquæ minerales salinæ,
Borax,
Alumen,
Plantarum Fructus Herbæ et Radices Acidi,
Lactis serum,
Lac ebutyratum.

VIII. Antispasmodica.

1. Ex Fossilibus.

Ambra,
Ambra Ambrosiaca L. S. N. 207,
Ambergrease.

Succinum,
Succinum electricum L. 108,
Amber.

Petroleum,
Bitumen Petroleum L. 109,
Rock oil.

Antispasmodica.

2. Ex Vegetabilibus.

Herbæ fœtidæ.

Artemisia,
Artemisia vulgaris M. 744,
Mugwort.

Atriplex fœtida,
Chenopodium Vulvaria M. 262,
Stinking orache.

Cuminum.

Matricaria,
Matricaria Parthenium M. 774,
Feverfew.

Pulegium.

Ruta,
Ruta graveolens M. 397,
Rue.

Sabina,
Juniperus Sabina M. 894,
Savin.

Gummi fœtidæ.

Asafœtida,
Ferula Asafœtida M. 281,
Asafœtida.

Ammoniacum,
*Stirps umbellifera ?

Gum ammoniac.

Galbanum,
Bubon Galbanum M. 285,
Galbanum.

Opopanax,
Pastinaca Opopanax M. 290,
Opopanax.

Sagapenum.

*Stirps umbellifera ?

Sagapenum.

Antispasmodica.

Gummi fœtidæ.

Tacamahaca,
Populus balsamifera L. M. M. 600,
Tacamahaca.

Camphora.

Radices graveolentes.

Pœonia,
Pœonia officinalis M. 502,
Pœony.

Valeriana silvestris,
Valeriana officinalis M. 80,
Wild valerian.

Fuligo ligni.
Olea essentiala.
Æthera.
Olea empyreumatica.
Alcohol.

3. Ex Animalibus.

Moschus,
Moschus moschiferus L. 91,
Musk.

Castoreum,
Castor Fiber L. 78,
Castor.

Sales alkalini volatiles.
Ammonia Ph. Lond.
Volatile alkali.

IX. Diluentia.

Aqua,
Aquosa blanda.

X. Attenuantia.

Aqua,
Alkalina,
Sales nutri,
Sapones,
Dulcia,
Saccharum,
Mel,
Glycyrrhiza,
Fructus siccatæ.

XI. Inspissantia.

Acida,
Alcohol,
Demulcentia farinosa et mucilaginosa.

XII. Demulcentia.

a. *Asperifoliæ.*

Consolida major,
Symphytum officinale M. 187,
Cumfrey.

Cynoglossum,
Cynoglossum officinale M. 186,
Hound's tongue.

b. *Mucilaginosa.*

Gummi Arabicum,
Mimosa nilotica M. 917,
Gum Arabic.

Gummi cerasi,
Prunus Cerasus M. 463,
Cherry-tree gum.

Gummi Tragacantha,
Astragalus Tragacantha M. 685,
Gum tragacanth.

Amylum,
Ex tritico vel aliis farinosis,
Starch.

Ichthyocolla
Acipenser Sturio L. 403,
Isinglass.

c. Gelatinæ ex rebus animalibus.

d. Oleosa blanda.

XIII. Antacida.

Lapides calcariæ,
Creta,
Magnesia alba,
Testacea,
Corallium,
Corallina,

Antacida.

Cornu cervi ustum,
Sales alkalini fixi,
Sales alkalini volatiles,
Calx viva.

XIV. Antalkalina.

Acida quæcunque supra inter refrigerantia enumerata.

XV. Antiseptica.

Sales acidi omnes supra inter refrigerantia recensiti,
Sales alkalini tum fixi tum volatiles,
Sales neutri ex acido quovis cum Sale alkalino vel cum terreis juncto,
Plantarum partes acidæ,
Olera acescentia,
Saccharum,
Mel,
Plantæ Siliquosæ vulgo antiscorbutica dictæ,
Plantæ alliaceæ,
Astringentia,
Amara,
Aromatica,
Olea essentialia,
Camphora,
Gummi Resinæ,
Crocus,
Radix Contrayervæ,
Radix valerianæ sylvestris,
Opium,
Decoctum capitum papaveris albi,
Vinum et liquores fermentati,
Alcohol.

XVI. Errhina.

Mitiora.

Beta,
Betonica,
Majorana.

Errhina.

Acriora.

Asarum,
Asarum Europæum M. 441,
Asarabacca.

*Helenium,
*Helenium autumnale M.769,
*Autumnal Helenium, Sneezweed.

Euphorbium,
Euphorbium officinale M. 449,
Euphorbium.

Helleborus albus,
Veratrum album M. 902,
White hellebore.

Iris nostras.

Nicotiana.

Ptarmica,
Achillea Ptarmica M. 777,
Sneezewort.

Pyrethrum,
Turbith minerale,
Hydrargyrus acido vitriolico junctus.

XVII. Sialogoga.

Externa masticatoria.

Angelica.
Caryophylli.

Imperatoria,
Imperatoria Ostruthium M. 289,
Masterwort.

Nicotiana.
Piper.
Pyrethrum.

*Zanthoxylum,
*Zanthoxylum Clava Herculis M. 884,
*Tooth-ach tree.

*Zanthoxylum tricarpum *Mich.*

Sialogoga.

Externa masticatoria.

*Prickly ash: Sooter's berries.
*Seneka.

Interna.

Hydrargyrus.

XVIII. Expectorantia.

Hedera terrestris.
Hyssopos.

Marrubium,
Marrubium vulgare M. 537,
White horehound.

Pulegium.

Enula campana,
Inula Helenium M. 766,
Elecampane.

Iris Florentina,
Iris Florentina M. 88,
Florentine Orrice.

Nicotiana.

Scilla,
Scilla maritima M. 328,
Squill.

Tussilago,
Tussilago Farfara M. 755,
Colt's foot.

Petasites,
Tussilago Petasites M. 756,
Butterbur.

Benzoinum.

Styrax calamita.
Balsamum Canadense.
Balsamum Tolutanum.

XIX. Emetica.

1. Ex Fossilibus.

Cuprum,
Hydrargyrus,
Antimonium,
Zincum.

Emetica.

2. Ex Vegetabilibus.

Asarum.

Erigerum,
Senecio vulgaris M. 756,
Groundsel.

Ipecacoanha,
Psychotria emetica M. 214,
**Vide* vol. 2. p. 15.
Ipecacuanha.

*Spiræa,
*Spiræa trifoliata M.
*Three-leaved Spiræa, or meadow-sweet; Indian Physic.

Nicotiana.
Scilla.
Sinapi.
Raphanus rusticanus.
Sales alkalini volatiles.
Amara.

XX. Cathartica.

1. *Mitiora.*

Acescentia.

Fructus acido-dulces recentes.
siccatæ.

Cassia Fistularis,
Cassia Fistula M. 393,
Cassia of the cane.

Tamarindus,
Tamarindus Indica M. 81,
Tamarind.

Dulcia.

Saccharum.
Mel.

Manna,
Fraxinus Ornus M. 918,
*Ornus Europæa *Persoon.*
Manna.

Radices dulces.
Olera blanda.

Cathartica.

Dulcia.

Rosa Damascena,
Rosa centifolia M. 474,
Damask rose.

Viola,
Viola odorata M. 803,
Sweet scented violet.

Polypodium,
Polypodium vulgare M. 935,
Polypody.

Serum lactis.
Lac ebutyratum.
Olea expressa blanda ex Vegetabilibus.
ex animalibus.
Sapo albus Hispanus.
Sinapi nigrum.
Sulphur.

Salina.

Tartarus.
Alkalina fixa.
Magnesia alba.
Sales neutri.
Aquæ minerales salinæ.
Amara.
Bilis animalium.
Balsamica.

2. *Acriora.*

Aloe,
Aloe perfoliata M. 337,
Socotrine and hepatic aloes.

Rhabarbarum,
Rheum palmatum M. 385,
Rhubarb.

Seneka,
Polygala Senega M. 640,
Rattle-snake root.

Genista,
Spartium Scoparium M. 644,
Broom.

Sambucus,
Sambucus nigra M. 295,
Common elder.

Cathartica.

Acriora.

Ebulus,
Sambucus Ebulus M. 295,
Dwarf elder.

Ricini Oleum,
Ricinus communis M. 865,
Castor oil.

Senna,
Cassia Senna M. 393,
Senna.

*Cassia Marilandica M. 394,
*Maryland cassia.
**Folia cathartica.*

Helleborus niger,
Helleborus niger M. 519,
**Potius* Helleborus orientalis *Willd.*
Black hellebore.

*Podophyllum peltatum M. 489,
*Duck's-foot, May-apple, Mandrake, Wild Lemons.

*Jeffersonia binata, B. *vel Editoris.*
**Est* Podophyllum diphyllum M. 439.
**Radix, ut prioris cathartica.*

Jalapium Ph. Lond.
Jalapa Ph. Edin.
Convolvulus Jalapa M. 201,
Jalap.

Scammonium,
Convolvulus Scammonium M. 200,
Scammony.

Rhamni baccæ,
Rhamnus Catharticus M. 232,
Buckthorn berries.

Gambogia,
Gambogia Gutta M. 490,
*Garcinia Gambogia *Willd*

Cathartica.

Acriora.

*Hæc est Gambogia Gutta, *supra.*
Gamboge.

Nicotiana.
Heleborus albus.

Colocynthis,
Cumus Colocynthis M. 869,
Bitter apple.

Elaterium,
Memordica Elaterium M. 868,
Elaterium.

Metallica.

Ex auro.
Ex Argento,
Ex Hydrargyro,
Ex Antimonio.

Emetica.

XXI. Diuretica.

a. *Umbellatæ.*

Petroselium,
Daucus,
Fœniculum,
Pimpinella,
Eryngium.

b. *Stellatæ.*

Aparine,
Rubia.

c. *Varia.*

Alkekengi,
Physalis Alkekengi M. 222,
Winter cherry.

Bardana,
Arctium Lappa M. 723,
Burdock.

Dulcamara,
Solanum Dulcamara M. 223
Bittersweet.

Diuretica.

Varia.

Gramen,
Triticum repens M. 127,
Quickgrass.

Lithospermum,
Lithospermum officinale M. 185,
Gromwell.

Ononis,
Ononis spinosa M. 651,
Restharrow.

Arum.
Asarum.
Asparagus.

Digitalis,
Digitalis purpurea M. 562,
Foxglove.

Enula campana.
Genista.
Nicotiana.
Persicaria.
Ranunculus.
Ruta.
Sabina.
Senega.
Scilla.

Amara.

Balsamica,
Siliquosæ,
Alliaceæ.

Ex Animalibus.

Cantharides,
*Lyttæ, *variæ species.*
Millepedæ,
Sales acidi,
Sales alkalini fixi,
Sales neutri,
Sapo albus Hispanus.

XXII. Diaphoretica.

Calendula,
Calendula officinalis M. 791,
Marigold.

Diaphoretica.

Crocus.
Dulcamara.
Opium.
Camphora.
Contrayerva.
Serpentaria.
Salvia.
Scordium.
Guaiacum.
Sassafras.
Senega.
Moschus.
Acida vegetabilia.
Alkali volatile.
Sales neutri.
Olea essentialia.

Diaphoretica.

Olea empyreumatica.
Vinum.
Alcohol.
Antimonium.
Diluentia.
Hydrargyrus.

XXIII. MENAGOGA.

Aloe.
Gummi fœtida.
Plantæ fœtidæ.
Crocus.
Castoreum.
Ferrum.
Hydrargyrus.

**Amara.*

*Chamæmelum.
*Lupulus.

* * *
* *

*Rubia Tinctorum.
*Rosmarinus.
*Pulegium.
*Polygala Seneka.

*Coffee,
*Coffea Arabica M. 215,
*Arabian Coffee, Coffee.

*XXIV. ANTHELMINTICA.

a. *Vegetabilia.*

*Spigelia,
*Spigelia Marilandica, M. 197,
*Maryland Spigelia, Carolina Pink-root, Pink-root.

*Melia,
*Melia azedarach M. 400,
*Bead-tree, Pride of China, China-tree.

*Helleborus Foetidus M. 519,
*Stinking Helleborus.
*Valeriana sylvestris.

Anthelmintica.

Vegetabilia.

*Chenopodium anthelminticum M. 262,
*Jerusalem-Oak, Worm-seed.

*Terebinthina.
*Camphora.
*Nicotiana.

*Dolichos pruriens M. 657,
*Cow-Itch, Cow-hage.

**Amara.*

*Cathartica.
*Saccharina.

**Mineralia.*

*Hydrargyrus.
*Vitriolum coeruleum.
*Arsenicum.
*Ferrum.
*Stannum.

* * *
* *

*Murias Sodæ,
*Muriate of Soda, or common Salt.

**Varia*, ut Ignatia, Geof-

Anthelmintica.

Vegetabilia.

frœa inernis, Helonias lutea (Devils-bite), Galega Virginica (Cat-gut), & aliæ species; aqua Calcis, aqua acido aerio impregnata, &c.

*XXV. ANTILITHICA.

**Vegetabilia.*
*a. *Adstringentia.*

*Uva Ursi.
*Pyrola umbellata M. 400,
*Umbelled Winter-green; Pyppsissewa.

Antilithica.

*b. *Amara.*

*Lupulus.

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*Digitalis.
*Nicotiana.

*Pareira Brava,
*Cissampelos Pareira M. 895.

*Convolvulus panduratus M. 200,
*Wild-potatoe, Hog- potatoe, &c.

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